Appendix B

Pertinent Correspondence

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United States Department of the Interior

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4270 Norwich Street
Brunswick, Georgia 31520

JUN 19 2003

Colonel Robert B. Keyser
United States Army Corps of Engineers
Mobile District
PO Box 2288
Mobile, AL 36628-0001

Re: FWS Log NG-02-181-MURR
Carter's Reregulation Dam, FERC No. 11301

Dear Colonel:

This letter is intended to address the concerns of the U.S. Fish and Wildlife Service (Service) related to ongoing operations of Carters Reregulation Dam. Carters Reregulation Dam is located on the Coosawattee River in Murray County, Georgia. On July 30, 2001, the Federal Energy Regulatory Commission (FERC) granted Fall Line Hydro Company a license to construct a powerhouse facility with an installed generating capacity of 4.5 MW at the existing United States Army Corps of Engineers (Corps) dam. All land at the site, including the dam and flow releases, are under jurisdiction of the Corps. The following comments and recommendations are submitted under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the Fish and Wildlife Coordination Act (16 U.S.C. § 661 *et seq.*), and the Federal Power Act (FPA) (16 U.S.C. § 791a, *et seq.*).

The Coosawattee River downstream of the project provides valuable habitat for important aquatic resources, including the federally-threatened goldline darter (*Percina aurolineata*), the State endangered trispot darter (*Etheostoma trisella*), the federally-endangered triangular kidneyshell (*Ptychobranchus greeni*), and the Federal candidate Georgia rocksnail (*Leptoxis downei*). We are concerned with the effects of the current operation of the dam (minimum flow, ramping rates, and water temperature) and the future effects of hydropower generation at the dam (dissolved oxygen) on downstream aquatic resources. Additionally, we would like to bring to your attention two issues: the implementation of a signed Memorandum of Agreement (MOA) between the Corps and Fall Line Hydro that allows the retrofit of Carter's Reregulation Dam, constituting a Federal action, and thus requiring consultation under section 7(a)(2) of the ESA, and the Service's March 26, 2003, proposal to designate critical habitat under the ESA for eleven species of freshwater mussels downstream of your facility.

Effects of Current Operation of Carter's Reregulation Dam

Minimum Flow

We understand that the minimum flow for Carter's Reregulation Dam is 240 cfs, which represents a 7Q10 flow. This flow was not intended to establish base flow conditions for protecting aquatic organisms and their habitat. The 7Q10 flow is a standard used to establish effluent limits to prevent pollutant concentrations from exceeding acceptable concentrations under extreme low flow conditions. By hydrological definition, the 7Q10 flow is a ten-year drought event, and has been associated with catastrophic reductions in available habitat for aquatic life (Evans and England, 1995).

Ramping Rates

Carter's Reregulation Dam was constructed in 1974 to regulate extreme flows released from Carters Lake Dam and ensure continuous outflows to protect the Coosawattee River below the project. While the flows exiting Carter's Reregulation Dam are dampened to some extent, periodically, ramping rates still occur that are detrimental to downstream aquatic resources. These ramping rates could be reduced and used to mimic a more natural flow regime, using data from the upstream United States Geologic Survey gage (Gage No. 02380500, Coosawattee River near Ellijay) as a model. Streamflow can be considered a "master variable" that regulates the ecological integrity of aquatic systems and limits the distribution and abundance of riverine species. Although to a lesser frequency, the effects resulting from the current operation of Carter's Reregulation Dam are the same as the effects below a daily peaking facility. Extreme, repeated fluctuations have no natural analogue in freshwater systems and represent a harsh environment of frequent, unpredictable flow disturbance.

> "Many aquatic populations living in these environments suffer high mortality from physiological stress, from wash-out during high flows, and from stranding during rapid dewatering. Especially in shallow shoreline habitats, frequent atmospheric exposure for even brief periods can result in massive mortality of bottom-dwelling organisms and subsequent severe reductions in biological productivity. Moreover, the rearing and refuge functions of shallow shoreline or backwater areas, where many small fish species and the young of large species are found, are severely impaired by frequent flow fluctuations. In these artificially fluctuating environments, specialized stream or river species are typically replaced by generalist species that tolerate frequent and large variations in flow. Furthermore, life cycles of many species are often disrupted and energy flow through the ecosystem is modified. Short-term flow modifications clearly lead to a reduction in both the natural diversity and abundance of many native fish and invertebrates" (Poff et al., 1997).

Hydrologic and habitat variation can strongly affect reproductive success and/or juvenile survival in lotic fish populations. At a flow-regulated site in the Tallapoosa River, young-of-year (YOY) fish abundance was correlated with the persistence of shallow-water habitats. Habitat persistence was severely reduced by flow fluctuations resulting from pulsed water releases (Freeman et al., 2001). Stream discharge fluctuations have been found to negatively impact adult smallmouth bass *(Micropterus dolomieu)* by inhibiting spawning efforts, and YOY smallmouth bass by increasing turbidity (inhibits feeding, reduces prey availability, and disturbs fry orientation) and causing mortality associated with longitudinal displacement of eggs and fry. Fluctuations in discharge have been similarly seen to affect spawning and/or recruitment in a gamut of fishes, including various centrarchids, salmonids, cyprinids, catostomids, and percids (Starrett, 1951; Peterson and Kwak, 1999; Freeman et al., 2001).

Stream habitat subject to such fluctuations also becomes unsuitable for freshwater mussels. Artificial flows result in unstable habitats in the form of repeated dewatering of shallow water areas (causing stranding and precluding colonization) and the scouring action of bankfull discharges that cause unstable substrates (Watters 2000; Layzer and Crigger, 2001). These flows can affect fish host abundance and habitat use, thereby affecting the reproductive success and recruitment of freshwater mussels (Layzer and Crigger, 2001).

The Coosawattee River leaves Carter's Reregulation Dam and joins the Conasauga River to form the Oostanaula River. Approximately two-thirds of the flow of the Oostanaula is formed by the Coosawattee. As easily compared by hydrographs, the irregular flows leaving Carter's Reregulation Dam are impacting not only the remainder of the Coosawattee downstream, but also the Oostanaula (http://water.usgs.gov/waterwatch, United States Geological Survey, February 25, 2003). Therefore, we are concerned about several freshwater mollusk species that inhabit the upper Oostanaula, including the triangular kidneyshell (also occurs in the Coosawattee), Georgia rocksnail, and the Alabama spike (*Elliptio arca*). The triangular kidneyshell is found in the upper Oostanaula and is only found in the Coosa, Oostanaula, Holly Creek, and the Conasauga. The Georgia rocksnail is only found in the upper Oostanaula. Its distribution is the smallest distribution of any mollusk in the Mobile Basin. The Alabama spike is only found in two rivers, one of them the Oostanaula (Paul Johnson, Tennesee Aquarium and Southeast Aquatic Research Institute, 2003, pers. comm.).

<u>Water Temperature</u>

Cold, hypolimnetic discharges, such as released from Carter's Reregulation Dam, can slow growth and inhibit reproduction in freshwater mollusks. Cold water temperatures prevent hatching of the eggs of freshwater snails, and prevent the formation of gametes of freshwater mussels (Watters 2000; Paul Johnson, pers. comm.). Non-reproducing freshwater mussels have been translocated from a cold water discharge area to warmer waters and were able to reproduce within a year (Watters 2000). Cold, hypolimnetic discharges can also influence reproductive timing in fishes (Freeman et al., 2001).

Future Effects of Hydropower Generation at Carter's Reregulation Dam

<u>Memorandum of Agreement</u>

On April 26, 2002, a signed Memorandum of Agreement (MOA) between the Corps and Fall

Line Hydro Company was submitted to FERC. The MOA establishes access privileges to federally-owned facilities and the terms and conditions by which the Licensee shall reimburse the Mobile District for all reasonable costs associated with the development of this MOA and the Operations MOA as required by Article 307 of the FERC License, the review of design and construction criteria, plans and specifications, and inspection of construction activities as they relate to the structural integrity or operation of the Carters Re-Regulation Dam in conjunction with the proposed hydropower project (FERC Project No. 11301-001). However, implementation of this agreement constitutes a discretionary Federal action that may affect listed species. Consultation with the Service, as required under section 7(a)(2) of the ESA, has not occurred.

Dissolved Oxygen

We are simultaneously corresponding with FERC regarding the effects of their hydropower project, specifically dissolved oxygen, that could be detrimental to downstream aquatic resources. A copy of our June 4, 2003 letter is enclosed. Although it is our understanding that the Corps will continue to control flow releases, Fall Line Hydro proposes to modify current operations by passing the discharge flow from the Carters Reregulation storage reservoir through the project powerhouse and turbine generating units instead of passing river flow over the dam spillway as currently operated by the Corps. In Section 2 of FERC's June 21, 2001, Environmental Assessment (EA), it is stated that dissolved oxygen (DO) levels in the project pool are regularly depressed and that releases of anoxic water from the proposed project is likely, based on the data provided by the Corps and the applicant. The low DO is currently mitigated by reaeration as the water passes over the cascade spillway. The EA further states that rerouting flows through the proposed powerhouse instead of allowing water to cascade over the spillway could result in decreased oxygen levels in the Coosawattee River below the project which would adversely impact aquatic resources. Based on the data presented in the EA, the proposed modification to the project will likely result in water with depressed levels of dissolved oxygen that fails to meet the State of Georgia's water quality standards for the maintenance of aquatic life.

According to the water quality monitoring and management plan (as required by Article 403 of the FERC license), the licensee is required to measure DO concentration and water temperature in the project tailwaters during the first and second years of project operation. If measurements fail to meet the State standards immediately downstream of the project, then water released from the hydropower project will be temporarily reduced and water releases across the spillway will be temporarily increased. However, if measurements indicate that water releases from the project are deficient (in DO or water temperature), but are still better than spillway releases, then water will be released from the project at its maximum authorized rate of release. The licensee will be required to notify FERC of any deviations from the 5.0 mg/L requirement specified in License Article 403.

In light of our new and ongoing unresolved concerns, we do not consider 2 years of monitoring (1/25th of the 50-year license term) adequate to protect downstream federally-listed species throughout the license term. The first two years of operation, for example, could represent unseasonably wet years. We are of the view that the water quality monitoring should be conducted throughout the license term in order to facilitate any needed operational changes to protect downstream federally-listed aquatic species.

Critical Habitat

In addition to our concerns as outlined above, we draw your attention to a concurrent issue that needs to be addressed. On March 26, 2003, we proposed the designation of critical habitat for three threatened mussels and eight endangered mussels in the Mobile River Basin, including the triangular kidneyshell (68 Fed. Reg. 14752-14832). This designation includes the Oostanaula River from its confluence with the Etowah River upstream to the confluence of the Conasauga and Coosawattee Rivers, the Coosawattee River from its confluence with the Conasauga River upstream to Georgia State Highway 136, the Conasauga River from its confluence with the Coosawattee River upstream to the Murray County Road 2, and Holly Creek from its confluence with the Conasauga River upstream to the confluence with Rock Creek. If this proposal is made final, the provisions of section 7(a)(2) of the ESA will be invoked and the Corps will be required to ensure that the actions that it funds, authorizes, or carries out in this area are not likely to jeopardize the continued existence of an endangered or threatened species, or result in the destruction or adverse modification of critical habitat. The destruction or adverse modification of critical habitat is defined as a direct or indirect alteration that appreciably diminishes the value of the critical habitat for both the survival and recovery of the species (50 CFR 402.02).

Summary

We are concerned with the effects of the current operation of the dam (minimum flow, ramping rates, and water temperature) and the future effects of hydropower generation at the dam (dissolved oxygen) on downstream listed species. Your ongoing operation of Carter's Reregulation Dam and your decision to allow Fall Line Hydro Company to retrofit your structure for hydropower generation should be revisited in light of the critical habitat proposal. We recommend that the Corps engage in consultation with us so that the impacts on species and habitat can be adequately addressed.

We appreciate the opportunity to advise the Corps with this project. If you have any questions, please contact staff biologist Alice Palmer at (706) 613-9493 ext. 22.

Sincerely,

Sandra S. Tucker
Field Supervisor

enclosure

cc: file
Magalie R. Salas, FERC, Washington, DC
Robert Davis, Fall Line Hydro, Lawrenceville, GA
Jerry Jones, USCOE, Mobile, AL
Sue Cielinski, USFWS, Atlanta, GA
Ralph Thompson, USFWS, Daphne, AL
Jerry Ziewitz, USFWS, Panama City, FL
John Biagi, GDNR, Social Circle, GA

References

Evans, J.W., and R.H. England. 1995. A Recommended Method to Protect Instream Flows in Georgia. Georgia Department of Natural Resources, Social Circle, Georgia.

Freeman, M.C., Z.H. Bowen, K.D. Bovee, and E.R. Irwin. 2001. Flow and habitat effects on juvenile fish abundance in natural and altered flow regimes. Ecological Applications 11(1): 179-190.

Layzer, J.B., and D.Crigger. 2001. The relationship between stream discharge and mussel recruitment. Final Report for Research Work Order 30, United States Geological Survey, Biological Resources Division, June 2001.

Peterson, J.T., and T.J. Kwak. 1999. Modeling the effects of land use and climate change on riverine smallmouth bass. Ecological Applications 9(4): 1391-1404.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Kerr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg. 1997. The Natural Flow Regime: A paradigm for river conservation and restoration. BioScience 47: 769-784.

Starrett, W.C. 1951. Some factors affecting the abundance of minnows in the Des Moines River, Iowa. Ecology 32 (1): 13-24.

Watters, G.T. 2000. Freshwater mussels and water quality: A review of the effects of hydrologic and instream habitat alterations. Proceedings of the First Freshwater Mollusk Conservation Society Symposium, 1999, Ohio Biological Survey.

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

15 AUG 2003

REPLY TO
ATTENTION OF

Inland Environment Team
Planning and Environmental Division

Ms. Sandra Tucker
Field Supervisor
U.S. Fish and Wildlife Service
247 South Milledge Avenue
Athens, Georgia 30605

Dear Ms. Tucker:

This correspondence is in response to your letter dated June 19, 2003, related to the ongoing operation of Carters Reregulation Dam. Based on the review of your letter, I agree that we need to initiate a dialogue with your office regarding concerns raised about potential effects on Federally listed species due to the current operation of Carters Lake hydropower facilities. The Carters Dam and Carters Reregulation Dam were completed in 1974 and provide a multipurpose project for flood control, hydropower, navigation, water quality, fish and wildlife enhancement, and recreation. The Reregulation Dam serves two purposes: as a lower pool for the pumped storage hydropower operation and to reregulate peaking flows from Carters Dam to provide a more stable downstream flow into the Coosawattee River. As we operate the facilities at these dams, we strive to balance the various authorized project purposes in an attempt to provide the best overall public benefit, while repaying the Federal Treasury for the capital investments at this project.

On the subject of the proposed Fall Line Hydro Company project at the Carters Reregulation Dam, we believe that the Endangered Species Act coordination/consultation should be directed to Fall Line Hydro Company and the Federal governing agency, the Federal Energy Regulatory Commission (FERC). The Federal Powers Act provides that FERC has the authority to license the development of hydropower projects by non-federal entities at U.S. Army Corps of Engineers (Corps) projects. The Corps would not receive benefits from such a non-federal hydropower facility. We view the Memorandum of Agreement (MOA) signed between the Corps and Fall Line Hydro Company to be a mechanism to ensure protection of Federal property, i.e., the reregulation dam, and to ensure no adverse impacts to our Federal project operations to meet the authorized project purposes.

Regarding the proposed designation of critical habitat for 11 mussel species within the Mobile River Basin, we understand from Mr. Paul Hartfield that the comment period, which closed on June 24, 2003, will reopen when the Economic Analysis Report is available for review.

Please notify us when that document is available and the comment period has been reopened. We look forward to reviewing this document.

While we recognize the need to initiate informal consultation with you on the effects of current operations, we stress that the pending Alabama-Coosa-Tallapoosa (ACT) Water Allocation Formula negotiations between the States of Alabama and Georgia could significantly affect our current project operations. Based on the MOA signed by the Governors of Alabama and Georgia on April 21, 2003, posting of the draft formula and supporting hydrologic models on May 1, 2003, and subsequent public review process, we believe that the states will reach formal agreement on ACT Water Allocation Formula in the near future.

We propose that our informal consultation related to the effects of our current operation be incorporated into our ongoing environmental evaluations related to the ACT Water Allocation Formula.

We plan to begin compiling historic flow regime and water quality data to facilitate our discussions. While we have some of the biological data on the Federally listed species, we would appreciate receiving copies of the materials referenced in your letter, as well as other literature related to life history information on these species.

We look forward to discussions with you on these matters and believe that such interdisciplinary and interagency dialogue is essential to identification of solutions to complex and controversial water resource issues. I am providing a copy of this letter to Ms. Magalie Salas, Federal Energy Regulatory Commission; Mr. Robert Davis, Fall Line Hydro Company; and Mr. John Biagi, Georgia Department of Natural Resources. Please contact Mr. Mike Eubanks, at (251) 694-3861, regarding initiation of this dialogue

Sincerely,

Robert B. Keyser
Colonel, Corps of Engineers
District Engineer

RECEIVED 10/16/08

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1875 Century Boulevard
Atlanta, Georgia 30345

OCT 16 2008

In Reply Refer To:
FWS/R4/ES

Colonel Byron G. Jorns
District Engineer
U.S. Army Corps of Engineers, Mobile District
Post Office Box 2288 (Attn: Chuck Sumner)
Mobile, Alabama 36628-001

Dear Colonel Jorns:

The Fish and Wildlife Service (Service) appreciates the opportunity to provide comments during the public scoping process regarding the revision of the United States Army Corps of Engineers' (Corps) Water Control Manuals (WCM) for the Alabama-Coosa-Tallapoosa (ACT) River Basin. We submit the following comments under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 *et seq.*).

Federally-listed aquatic species, as well as critical habitat, exist throughout the ACT basin. Because the WCMs affect the ACT river basin, the Corps and the Service will need to coordinate closely to ensure any ESA issues, such as potential impacts to the listed species and critical habitat, are fully addressed. In addition, we consider this public scoping process, and subsequent meetings, an opportune juncture to improve aquatic habitats for all species in the ACT basin. We look forward to being an active stakeholder during the revision process.

General Comments

Service personnel participated in the Corps' September 11, 2008, Interagency Scoping Meeting to discuss the WCM updates and associated development of the Environmental Impact Statement (EIS). During that meeting, the Corps raised the idea of developing technical workgroups to address specific topics of information that need to be investigated as part of the revision process and asked for agency input on this matter. The Service supports the development of these workgroups and would be willing to actively participate in the technical workgroups applicable to our agency's mandates and trust resources.

Comments regarding Corps Operations within Georgia

Surveys

Federally-listed and candidate freshwater mollusks and fishes inhabit the mainstem rivers of the Coosa Basin below Carters and Allatoona. Within the last eleven years these species are known to include the federally-threatened goldline darter (*Percina aurolineata*) in the Coosawattee River below Carters Reregulation Dam, potentially the federally-endangered Etowah darter (*Etheostoma etowahae*) in the Etowah River below Allatoona Dam, the federally-endangered triangular kidneyshell (*Ptychobranchus greeni*) in the Coosawattee and Oostanaula Rivers, shell material of the federally-endangered southern clubshell (*Pleurobema decisum*) in the Oostanaula and Coosa Rivers, and the Federal candidate species interrupted rocksnail (*Leptoxis formani*) in the Oostanaula River.

We recommend updated surveys be conducted for federally-listed fishes and freshwater mollusks to accurately assess the potential impacts of the Corps' alternative actions. Information gathered regarding many State-imperiled aquatic species as part of this survey effort would also be beneficial. The most recent comprehensive survey conducted for federally-listed mussels in these mainstem rivers was conducted in 1997 (Williams and Hughes 1997). The mainstem Coosawattee below Carters Reregulation Dam and the mainstem Etowah below Allatoona Dam have not had targeted surveys for federally-listed fishes since 1998 (Freeman 1998). Except for a Georgia Department of Natural Resources (GDNR) standardized sampling survey and collection efforts for an *Etheostoma* genetics study, we are not aware of these two stretches of mainstem river being surveyed for fishes since this time (Ritchea 2006; GDNR 2002 & 2003; Brett Albanese, GDNR, 2008, pers. comm.). Recent genetic studies have discovered federally-listed Etowah darters either exhibiting syntopy or hybridization with greenbreast darters (*Etheostoma jordani*) below Allatoona (Freeman et al. 2006). Additional tissue material is needed for nuclear genetic analysis using microsatellites to clarify the situation at hand. Therefore, any survey effort should be coordinated with these researchers to consider obtaining additional genetic material and to provide them the opportunity for further analysis, if feasible.

Operations at the Lake Allatoona Project

Current dam operations at Lake Allatoona have detrimental effects on water quality and the natural flow regime in the Etowah River downstream of Allatoona Dam. Suitable dissolved oxygen levels, water temperatures, and flow are necessary for survival, reproduction, and recruitment of fishes and mussels. A Corps water quality study and associated environmental assessment (EA) found that the tailrace waters do not always meet State dissolved oxygen water quality standards during periods of non-peak generation, sometimes dropping as low as 2 parts per million (Corps 2000). An oxygen diffuser was used from 1968 to 1986 to improved downstream dissolved oxygen levels, but has not been used since 1986. The 2000 EA selected a preferred alternative that consisted of rehabilitating the Allatoona powerhouse to increase dissolved oxygen levels in the tailrace. A finding of no significant impact was authorized in 2000 for this upgrade, but the powerhouse was never rehabilitated. We recommend that this WCM update consider installing some method to increase dissolved oxygen levels in the Etowah River downstream of Allatoona Dam. We do not know if tailrace temperatures are likewise altered as a result of dam operations at Lake Allatoona, but downstream water temperature data representing existing conditions should be compiled and analyzed. If adequate data does not exist to represent current conditions, we recommend these data be collected. If downstream water temperatures are, in fact, significantly different from temperatures that would naturally occur in an unimpaired scenario, we recommend the Corps consider a retrofit at Allatoona Dam that would more closely approximate natural water temperatures.

Allatoona Dam operates in a hydropeaking mode, generating power between two and six hours during normal operations each weekday. Weekend generation may occur if required to meet customer needs, but generally only the 250 cubic feet per second (cfs) minimum flow is released on the weekends. A typical weekday pattern of flows downstream of the dam exhibits fluctuations between 250 cfs and approximately 7,500 cfs (Corps 1998). Flow instability caused by daily peaking operations likely affects recruitment and reproductive success of many fishes (Irwin and Freeman 2002). Stream habitat below hydropeaking dams can also become unsuitable for mussels because of the alternate wetting and drying of riffles and scouring action of discharges. Additionally, regulated flow can affect the abundance and habitat use of fishes serving as host species for freshwater mussels (Layzer and Crigger 2001; Watters 2000). These host fishes may be less abundant or occupy different habitats that make the necessary contact with larval mussels unlikely, or if fishes are already infected with larval mussels, excysting juveniles may be distributed into unsuitable habitats (Layzer and Crigger 2001). Providing periods of stable flow without pulsed intervals of power generation should increase opportunities for fish to reproduce and for larvae to develop successfully (Irwin and Freeman 2002). A study on a regulated reach of the Tallapoosa River found young-of-year fish abundance was most frequently correlated with the persistence of shallow-water habitats (Freeman et al. 2001). We recommend the Corps consider dam operations at Allatoona Dam that would more closely mimic the natural flow regime, such as implementing a non-peaking window during the portion of the year that is most sensitive to aquatic organisms in the downstream Etowah River.

The current minimum flow for Allatoona Dam is 250 cfs, which represents the annual 7Q10 flow. A 7Q10 flow represents a ten-year drought event and is a standard used to establish effluent limits that prevent pollutant concentrations from exceeding acceptable concentrations under extreme low flow conditions. It was not intended to establish base flow conditions for protecting aquatic organisms and habitat, and has been associated with reductions in available habitat for fish and other aquatic life (Evans and England 1995). We recommend the minimum flow under existing conditions for Lake Allatoona be compared to an alternative that more closely approximates the natural flow regime. The flow alternatives that will be considered for the WCM updates should be analyzed for potential relative effects to the downstream riverine biota. This could be accomplished by using the Riverine Community Habitat Assessment and Restoration Concept (RCHARC), as was done in the Draft Environmental Impact Statement (DEIS) for the Water Allocation for the ACT Basin, or similar methodology based on the same concept. RCHARC is based on the premise that native riverine communities of aquatic organisms evolved under patterns of spatial and temporal variability in physical habitat that result from long-term natural flow regimes, and therefore, managing regulated streams to mimic the variability of natural streams will protect native riverine biodiversity (Corps 1998).

Operations at the Carters Lake Project

We are not aware of dissolved oxygen impairment in the Coosawattee River below Carters Reregulation Dam as a result of existing operations. We understand that the required minimum flow is released over a spillway and thus is subject to some aeration as it leaves Carters Reregulation Dam. However, the small amount of dissolved oxygen raw data we have reviewed, also summarized in a Federal Energy Regulatory Commission (FERC) Final Environmental Assessment (EA) for the Carters Reregulation Dam Hydropower Project (FERC 2001) were not collected during the recent prolonged period of drought operations. We do not know if tailrace temperatures are altered as a result of dam operations at the Carters Lake Project. Therefore, downstream dissolved oxygen and water temperature data for the Coosawattee River representing existing conditions should be compiled and analyzed. If adequate data does not exist to represent current conditions, we recommend these data be collected. If downstream water temperatures and dissolved oxygen levels are, in fact, significantly different from temperatures and dissolved oxygen levels that would naturally occur in an unimpaired scenario, we recommend the Corps consider a retrofit at Carters Reregulation Dam that would more closely mimic natural water temperatures and dissolved oxygen levels.

The two dams that make up the Carters Lake Project, Carters Dam and Carters Reregulation Dam, are used as a pumped-storage peaking facility. The Corps usually generates hydropower at Carters Dam for a few hours each weekday, and then the turbines reverse and pump water back up from the reregulation pool into Carters Lake when demand for electricity is low (usually during the night or on weekends) to have water available for the next peak use period (Corps 1998). Therefore, the flow exiting the reregulation pool into the lower Coosawattee River does not exhibit a hydropeaking flow regime. However, we recommend the Corps compile and analyze the ramping rates exiting Carters Reregulation Dam to the Coosawattee River under existing operations. If downstream ramping rates are significantly different from ramping rates that would naturally occur in an unimpaired scenario, we recommend the Corps consider a change in operations at Carters Reregulation Dam that would more closely mimic natural changes in flow, at least during the portion of the year that is most sensitive to aquatic organisms in the downstream Coosawattee River.

The current minimum flow for Carters Reregulation Dam is 240 cfs, which represents the annual 7Q10 flow. As mentioned above, a 7Q10 flow represents a ten-year drought event and is a standard used to establish effluent limits that prevent pollutant concentrations from exceeding acceptable concentrations under extreme low flow conditions. It was not intended to establish base flow conditions for protecting aquatic organisms and habitat, and has been associated with reductions in available habitat for fish and other aquatic life (Evans and England 1995). We recommend the minimum flow under existing conditions for Carters Reregulation Dam be compared to an alternative that more closely mimics the natural flow regime. The flow alternatives that will be considered for the WCM updates should be analyzed for potential relative effects to the downstream riverine biota by using the RCHARC, or similar methodology based on the same concept, as was done in the Draft Environmental Impact Statement (DEIS) for the Water Allocation for the ACT Basin (Corps 1998).

Mitigation for Carters Lake Project

The construction of Carter's Lake was authorized by the River and Harbor Act of March 2, 1945. Project construction was initiated in 1962 and was completed in 1975. The project is located on the Coosawattee River, 26.8 miles above its juncture with the Conasauga River, near the town of Carters in Murray, Gilmer, and Gordon Counties, Georgia. To date, no mitigation for aquatic resources has been developed. Mitigation for wildlife (including wetland and terrestrial ecosystems) has been debated but not resolved. Approximately 4,200 terrestrial acres were inundated, 40.9 miles of streams were impounded, 0.4 miles of stream were filled, and wetland loss is unknown. We recommend that these terrestrial and stream impacts for the development of Carters lake be included in the DEIS and as a result, mitigative measures be implemented.

If you have any questions regarding these Georgia-specific comments, please contact staff biologist Alice Lawrence at (706) 613-9493 ext. 222.

Comments regarding Corps Operations within Alabama

Threatened and Endangered Species - There are at least 12 extant federally-listed species found in mainstem river reaches of the ACT that have the potential to be affected by reservoir operations. These include:

Alabama sturgeon	*Scaphirhyncus suttkusi*	Endangered
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Threatened
Goldline darter	*Percina aurolineata*	Threatened
Tulotoma snail	*Tulotoma magnifica*	Endangered
Inflated heelsplitter	*Potamilus inflatus*	Threatened
Heavy pigtoe	*Pleurobema taitianum*	Endangered
Southern clubshell	*Pleurobema decisum*	Endangered
Triangular kidneyshell	*Ptychobranchus greenii*	Endangered
Fine-lined pocketbook	*Hamiota altilis*	Threatened
Interrupted rocksnail	*Leptoxis foremani*	Candidate
Rough hornsnail	*Pleurocera foremani*	Candidate
Wood stork	*Mycteria americana*	Endangered

You should also consider the federally-listed species found in tributary streams and nearby terrestrial habitats of the ACT basin that have the potential to be impacted by reservoir operations. These include:

Painted rocksnail	*Leptoxis taeniata*	Threatened
Cylindrical lioplax	*Lioplax cyclostomaformis*	Endangered
Lacy elimia	*Elimia crenetella*	Threatened
Blue shiner	*Cyprinella caerulea*	Threatened
Georgia rockcress	*Arabis georgiana*	Candidate
Price's potato-bean	*Apios priceana*	Threatened
AL canebrake pitcher-plant	*Sarracenia rubra alabamensis*	Endangered
Kral's water-plantain	*Sagittaria secundifolia*	Threatened

Harperella	*Ptilimnium nodosum*	Endangered
Georgia aster	*Symphyotrichum georgianum*	Candidate
Tennessee yellow-eyed grass	*Xyris tennesseensis*	Endangered
Mohr's Barbara's buttons	*Marshallia mohrii*	Threatened
Alabama leather-flower	*Clematis socialis*	Endangered
Green pitcher-plant	*Sarracenia oreophila*	Endangered

Note that Georgia rockcress, Georgia aster, and Price's potato-bean have been found on or near river bluffs overlooking mainstem ACT rivers and reservoirs.

Critical habitat for 10 species of mussels has also been designated throughout the ACT basin. These include:

Southern acornshell	*Epioblasma othcaloogensis*	Endangered
Ovate clubshell	*Pleurobema perovatum*	Endangered
Southern clubshell	*Pleurobema decisum*	Endangered
Upland combshell	*Epioblasma metastriata*	Endangered
Triangular kidneyshell	*Ptychobranchus greenii*	Endangered
Alabama moccasinshell	*Medionidus acutissimus*	Threatened
Coosa moccasinshell	*Medionidus parvulus*	Endangered
Southern pigtoe	*Pleurobema georgianum*	Endangered
Fine-lined pocketbook	*Hamiota altilis*	Threatened
Orange-nacre mucket	*Hamiota perovalis*	Threatened

Critical habitat for one species of fish is currently being proposed:

Alabama sturgeon	*Scaphirhyncus suttkusi*	Endangered

Because many of these species were isolated and fragmented due to reservoir development and water quality conditions, we encourage the Corps to participate with Federal and State agencies to develop a comprehensive monitoring plan to identify any remaining unknown or historically known populations in the basin.

The Service, working with State, other Federal, non-government, and private business partners, have identified potential re-introduction sites for recovery of listed aquatic species within the ACT basin. We would like to enlist the Corps as a partner in this large-scale recovery effort (O'Neil et. al 2008). In addition to aquatic recovery efforts, we would like the Corps to consider terrestrial habitats under their ownership as potential locations for outplanting of federally-listed plants should the need and opportunity arise.

Species of Greatest Conservation Need - In an effort to keep more species from becoming imperiled to the point of requiring Federal listing under the ESA, the Alabama Department of Conservation and Natural Resources has identified Species of Greatest Conservation Need (GCN) in the state; several of these are found within the ACT basin. The spotted rocksnail (*Leptoxis picta*), at least 2 species of mussels (painted clubshell, *Pleurobema chattanoogaense;* southern purple lilliput, *Toxolasma corvunculus*) and one species of fish (Alabama shad, *Alosa alabamae*) are found in mainstem ACT rivers. GCN bird species considered to be of high conservation concern that utilize wetlands and floodplain forests in interior Alabama include the least bittern (*Ixobrychus exilis*), American black duck (*Anus rubripes*), swallow-tailed kite (*Elanoides forficatus*), yellow rail (*coturnicops novaboracensis*), American woodcock (*Scolopax minor*) and the Swainson's warbler (*Limnothlypis swainsonii*). Any update to the Corps' WCM should address the potential of Corps reservoir operations to impact species that may be on the brink of requiring federal protection under the ESA.

Fish and Aquatic Organism Passage - Dams on the Alabama River have blocked historic migrations of more than a dozen species of fish for several decades, and have contributed to the decline of the critically imperiled Alabama sturgeon. High flows that overtop the dams and opening of dam locks at Claiborne and Miller's Ferry have been identified as methods to facilitate aquatic organism passage on the Alabama River. We recommend that the Corps continue to facilitate research on fish passage at Corps dams on the ACT, including research on timing and duration of attraction flows, monitoring and tracking of species through the lock and dam structures, and "dummy" locking, with the goal of implementing Corps reservoir operations that allow riverine species to travel their historic migration pathways.

Water Quality - The effect of reservoir operations on water quality should be addressed in the WCM update, including existing and potential effects to dissolved oxygen, temperature, pH, conductivity, nutrient and organic material dynamics, and various industrial and municipal discharges. A monitoring program addressing water quality in reservoirs and tailwaters should be designed and implemented to detect, report, and mitigate water quality issues that may impact benthic and pelagic species.

Flow Dynamics - A number of natural flow regime components (e.g., base, seasonal, and minimum/maximum flow levels, frequency/duration of low/high pulse flows, flow rise/fall rates and frequency of flow reversals) are important, even critical, to the long-term maintenance and protection of the basin's riverine fauna and habitats. These natural flow characteristics can provide a template for management strategies at water control facilities, as well as for future water management changes that may result from a basin-wide allocation formula. We recommend that the conservation and/or recovery of as many of these natural flow conditions as possible be fully considered in the development and implementation of the new WCM for the ACT basin. In Alabama, the effects to downstream aquatic biota and riverine ecology from diurnal hydropower peaking flows from the RF Henry and Miller's Ferry Dams, which are often described as run-of-the-river dams, should be examined.

Riparian and Wetland Habitats - The ecological integrity of riverine systems is intimately connected to the quality and quantity of streamside floodplain forests and wetlands. The review and updating of the WCM should address effects to the vegetation ecology of adjacent wetlands and floodplain forests, as well as the wildlife resources dependent upon them including migratory birds. For example, the federally endangered wood stork (*Mycteria americana*) relies on the shallow wetland areas adjacent to the Alabama River during the summer and fall each year for foraging.

Technical Working Group for Water Modelers - To facilitate information sharing and involvement with the WCM update process, we recommend that a technical working group of water modelers from interested stakeholders familiar with the HEC-ResSim Reservoir Simulation be formed and meet on a regular basis during and after the completion of the WCMs.

Integrated Drought Plan - The WCM update should integrate a basin-wide drought plan that addresses water allocation issues among stakeholders in Georgia and Alabama, as well as the operation of dams operated by Alabama Power Company on the Coosa and Tallapoosa Rivers. A drought plan should adequately identify water quality and quantity needs at various times of the year.

If you have any questions regarding these Alabama-specific comments, please contact staff biologist Dan Everson at (251) 441-5837.

Sincerely,

Acting

Noreen Walsh
Assistant Regional Director
Ecological Services
Southeast Region

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO:

MAY 0 3 2010

Colonel Byron Jorns
US Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Subject: Planning Aid Letter regarding the Alabama-Coosa-Tallapoosa Water Control Manual Updates

Dear Colonel Jorns:

We are providing your agency with a Planning Aid Letter (PAL) for the proposed Water Control Manual (WCM) Updates for the Alabama-Coosa-Tallapoosa (ACT) Basin in Georgia and Alabama. The purpose of the updates is to identify operating criteria and guidelines for managing water storage and release of water from U.S. Army Corps of Engineers (Corps) reservoirs. The resulting documents will guide water management operations. In the National Environmental Policy Act (NEPA) review, the Corps will address current operations, proposed changes in water management operations at the reservoir projects within the limits of the existing authorities, as well as potential impacts throughout the basin that would result from implementation of the updated manual.

The purpose of the PAL is to identify resource values and issues, identify federally protected species issues, and propose preliminary changes, mitigation, or enhancement opportunities to facilitate your decision-making as it relates to equal consideration of fish and wildlife resources. We submit the following comments and recommendations under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the Migratory Bird Treaty Act (MBTA)(49 Stat. 755, as amended; 16 U.S.C. § 702 *et seq.*), and the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*). These comments are based on previous studies and government documents as well as new datasets and information provided by State and Federal agencies. Continued efforts will be made to provide additional expertise and information in the form of another PAL and/or the draft FWCA reports. A separate consultation will occur regarding the potential impacts of the Corp's proposal on federally-listed threatened and endangered fish and wildlife species protected under the ESA.

We stress that in the following letter, our recommendations are preliminary. Monitoring of many important ecological parameters in the ACT following dam construction has been limited. Unfortunately, even 40 years after construction we lack critical data on the dissolved oxygen levels above and below Corps reservoirs, as well as effects of hydropower peaking flows on fish assemblages. New information often changes our understanding of ecological response to complex natural and human-influenced variables. Rather than attempt, in one document, to prescribe definitive management guidelines for possibly decades of dam operations, we would like to begin working with the Corps to build an adaptive management framework for operations that explicitly outlines goals and objectives of operations, continually monitors and analyzes ecosystem response, and adjusts operations accordingly based on what we have learned. Adaptive management of river systems helps to link the resistance and resilience of species and ecosystems to a natural range of flow variation. Management should occur over a geographic

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at the same location every year (Sparks 1998). Necessarily we will recommend research and monitoring as a primary component of dam operations.

1.0 PRIOR STUDIES OR REPORTS

A complete review of the many reports, analyses, lawsuits, and volumes of data associated with water management in the ACT is beyond the scope of this report, but we will reference several documents in this PAL that are important to management of fish and wildlife resources.

The US Fish and Wildlife Service (Service) previously made available a list of federally protected species and other species of concern in 2008 as part of the initial scoping for this project. Since then, critical habitat has been designated for the Alabama sturgeon in the Alabama and Cahaba Rivers (USFWS 2009). The rough hornsnail and interrupted rocksnail have been proposed for listing, and there is a proposal to designate critical habitat for them below Jordan Dam. Revisions to this list will continue to be provided as necessary as the draft and final FWCA reports are developed.

A Service recovery plan for federally listed aquatic species in the Mobile River Basin was completed in 2000, and had input from many partners in the basin including the Corps. The recovery plan outlines many of the issues that must be addressed to protect species that are listed under the ESA(USFWS 2000). Because the system of dams operated by the Corps has a significant influence on habitat availability and suitability in the ACT, an update to the WCMs for these dams has the potential to provide significant benefits for these species, as well as many other species not protected under the ESA.

2.0 GENERAL DESCRIPTION OF FISH AND WILDLIFE RESOURCE CONDITIONS

Aquatic resources within the ACT basin are heavily impacted by human development, including the construction and operation of dams, channelization, and dredging and water quality degradation (USFWS 2000, 2006; Atkins et al. 2004). Cumulatively, these activities are physically degrading habitats, decreasing or eliminating natural variability of water flows, and fragmenting populations of many aquatic organisms.

Dams constructed for hydropower generation, navigation, flood control, water supply, and recreation have impounded about 600 river miles of aquatic habitat in the ACT Basin (USFWS 2000), including more than 230 miles impounded by Corps dams (USACE 1998). Impoundments and flow regulation have induced changes in aquatic habitats by altering sediment deposition, flow patterns, rates of geomorphic channel adjustment, and water quality conditions throughout the river system. Dams also function as barriers to aquatic species movement. Consequently, many native species are extinct or extirpated from significant portions of the ACT Basin as a direct or indirect result of dam construction. (Bogan et al. 1995; USFWS 2000).

Channelization has occurred within every major river system within the ACT (USACE 1990, USFWS 2000). Activities for straightening, deepening, and/or enlarging stream and river channels were particularly concentrated in the Alabama River portion of the drainage (USACE 1990). The effects of channelization on aquatic habitats include loss of habitat diversity, substrate stability, and riparian canopy; accelerated bed and bank erosion; and altered depth (Brooks 1994). While channel dredging diminished in recent years, continued geomorphic response to channelization is manifested through channel erosion, channel filling, and headcutting (USFWS 2000).

Dredging to support vessel navigation in the Alabama River initially involved removal of shallow shoals and other historic aquatic habitats for species that are now imperiled (USFWS 2000). This removal destroyed benthic organisms and their habitats, eliminated habitat and prey for fishes and turtles, initiated and perpetuated upstream instability and erosion, and increased downstream turbidity (USFWS 2000). Initial habitat losses were severe, whereas current maintenance dredging and spoil disposal of seasonally accumulated sediments is thought to have less of an impact, only because many sensitive species have already been eliminated, and surviving species are distributed according to current patterns of deposition and erosion (Hartfield and Garner 1998).

The following sections will discuss several of the important issues that should be addressed in evaluating operational parameters in the Corps' updating of the WCMs for dams of the ACT Basin. This will be followed by a reach-by-reach discussion of fish and wildlife-related issues

2.1 Instream Flow

With the updates to the WCM, the Corps has an opportunity and obligation to help restore and/or maintain instream flows that provide habitat for all life stages of aquatic species (adult feeding, spawning, egg and larval survival, and nursery and rearing habitat). Instream flows are also necessary to enable migration of anadromous, catadromous, potadromous, and riverine fish over and around barriers (including necessary attraction flows for fishways), and to provide water quality to sustain biota and high quality habitats.

We recognize the operational constraints to achieving environmental flow objectives imposed by the many competing uses for water in Alabama and Georgia. However, opportunities still exist for providing flows for bypassed natural river channels downstream of hydropower projects, adjusting flows in highly regulated river sections downstream of hydropower dams, providing non-peaking flow windows during critical spawning periods, and providing adequate flows for water quality maintenance in water segments that have experienced species die-offs.

A number of natural flow regime components (e.g., base, seasonal, and minimum/maximum flow levels, frequency/duration/timing of low/high pulse flows, flow rise/fall rates and frequency of flow reversals) are important, even critical, to the long-term maintenance and protection of the basin's riverine fauna and habitats. These natural flow characteristics can provide a template for management strategies below Corps dams, as well as for future water management changes that may result from a basin-wide allocation formula. The frequency and magnitude of channel forming flows (generally high flows with a 1 to 2-year return interval) are important for maintaining natural rates of geomorphic change and habitat maintenance (Dunne and Leopold 1978). We recommend that conservation and/or recovery of as many of these natural flow regime components be fully considered in the development and implementation of the new WCM for the ACT basin.

Flow regulation has negatively affected biota and habitat throughout the basin. The effects to downstream aquatic biota and riverine ecology from daily hydropower peaking flows from the RF Henry and Miller's Ferry dams, which are often described as run-of-the-river dams, should be examined. The diversion of flows from a portion of the Coosa River near Weiss Reservoir caused desiccation of habitats and extirpation of multiple species. Hydropower peaking flows are also experienced by the aquatic organisms in the Etowah River below Allatoona Dam in Georgia. By design the Carters Reregulation Dam largely eliminates peak flow pulses from the Carters Reservoir Project, but the two dams comprising the project still eliminate much of the natural flow variability of the Coosawattee River, particularly the high flow component.

Thorough explanations of the physical, chemical, and ecological benefits from base flows, pulses, stable flow windows for spawning, and intra- and interannual flow variation are outside the scope of this letter; however we refer the reader to Junk et al 1989, Poff et al. 1997, Richter et al. 1998, Freeman et al. 2001, Postel and Richter 2003, and Mathews and Richter 2007 for fuller descriptions. The importance of baseflows, pulses, and flood flows are described within these resources.

In the middle portion of the ACT Basin, instream flow recommendations for re-licensing of hydropower dams owned by Alabama Power Company (APC) have largely followed the framework developed by the joint U.S. Environmental Protection Agency (EPA)/Service *Instream Flow Guidelines for the ACT* (Alabama-Coosa-Tallapoosa) *and ACF* (Apalachicola-Chattahoochee-Flint) *Basins Interstate Water Allocation Formula* (USFWS/EPA 1999). These flow regime guidelines are based on the principle that ecosystems evolved as a response to the natural flow regime, and that restoration of some natural flow regime components can restore structural and functional ecosystem elements that were lost or reduced as a consequence of flow regulation. Since the development of the 1999 flow guidelines, new flow analysis tools have been developed that facilitate more comprehensive descriptions of flow regimes and flow recommendations. One such tool is the Environmental Flow Components (EFCs) in Indicators of Hydrologic Alteration (IHA, Mathews and Richter 2007).

EFCs were used by the Service to develop flow guidelines for the ACF PAL for the WCM update, and for this PAL, we advocate the Corps follow a similar approach.

We recommend that water management in the ACT Basin, to the extent possible, be coordinated from headwaters to delta using methods and tools available in the resources cited in this section. This will require continued significant coordination with APC as well as State water resource agencies.

2.2 Water Quality

Water quality below several Corps dams, including Millers Ferry and Allatoona, does not meet State water quality standards. With the update to the WCM, the Corps has an opportunity and obligation to help maintain, restore, and/or enhance adequate water quality for the support of all life stages of aquatic species in the ACT Basin. Monitoring by the Alabama Department of Environmental Management (ADEM) in the summers of both 2008 and 2009 in several sections of the Alabama River indicated that dissolved oxygen levels occasionally dropped below 4.0 mg/L for several hours in the main channel, and on a few occasions dropped below 3.0 mg/L (ADEM preliminary datasonde data, 2008-2009). Data collected by the Service in the summer of 2009 on the Etowah River below Allatoona Reservoir indicated DO levels lower than 1.0 mg/L. (Figure 4). Low DO is a pervasive summer problem that needs to be addressed.

Water quality in all reaches needs to be adequate for successful reproduction and recruitment, as well as sustained growth of adults and juveniles (Watters 2000). DO and water temperature problems associated with inadequate instream flows, hypolimnetic discharges, stratification, and/or other causative reservoir discharge problems (e.g., the transport of pesticides, nutrients, biological/chemical oxygen demand-BOD/COD, and metals) should be identified and corrected at Corps dam facilities. Monitoring of water quality parameters to determine if ecological needs are met should be standard practice in dam operations, and ecological response to water quality changes should also be monitored.

2.3 Habitat Protection

The Corps has an opportunity and responsibility to protect and restore important riverine and associated aquatic habitats, and avoid additional losses of mainstem riverine habitat resulting from dam operations. These habitats include river bottoms, especially those supporting important structural and/or substrate features, shorelines, riparian zones, impacts from changing land uses, and associated wetland systems that serve as fish habitat and/or provide water quality and/or riverine morphological support functions.

Significant river-dependent habitats include the rich floodplain forests of the Alabama River, as well as the world-class wetlands and bottomland habitats of the Mobile-Tensaw Delta and Mobile Bay. Forest and grassland communities within the zone of annual, decadal and multi-decadal fluvial processes, including such disturbances as flooding and bank sloughing, are often distinctly different than communities outside that impact zone. Naturally, general moisture availability and the daily interaction between aquatic and terrestrial communities accounts for some of this unique riparian-zone character. However it's equally apparent that the regular fluvial processes of deposition and erosion and a fluctuating water table, influenced greatly by Corps dams, play a significant role in mediating species success and dominance within those communities. Forest communities of the Alabama River bluffs also have acted as refugia and "species highways" for eons of climate change (Bill Finch, The Nature Conservancy, per. comm. 2010), suggesting that Corps infrastructure and land use related to water management in the ACT Basin can directly impact terrestrial forest community composition and persistence as well.

As a result of habitat fragmentation and population isolation, many of the aquatic species of federal and state concern will require population management and manipulation to maintain genetic flow between isolated populations, to reintroduce species to restored habitats, and, in some cases, prevent extinction. Priority sub-basins important for refugia and maintaining genetic flow are listed in the following document, as are the reaches designated as Critical Habitat as defined by the Service (USFWS 2004). We will also include reaches that have been identified as potential reintroduction/augmentation sites (Hartfield et al. 2010). To reestablish species in currently unoccupied habitats, it will likely be necessary to reintroduce animals through an active culture and propagation program. The Alabama Department of Conservation and Natural Resources (ADCNR), Division of Wildlife and Freshwater Fisheries, has established a state-of-the-art facility, the Alabama Aquatic Biodiversity Center (AABC), located at the former Claude Harris Federal Fish Hatchery in Marion, Alabama, dedicated exclusively to the culturing and propagation of non-game aquatic species. The Corps can help greatly in this undertaking by partnering with the AABC and utilizing their authority and resources to help protect and restore important aquatic habitats and flow regimes for species of concern in the ACT Basin.

Mitigation for loss of significant aquatic habitat, including inundation of over 40 miles of once free-flowing streams, has yet to be developed for the Carters Dam project in Georgia, completed in 1975. Mitigation for terrestrial and stream impacts for this project are long overdue, and should be addressed in the Draft Environmental Impact Statement (DEIS).

2.4 Aquatic Organism Passage

Fish passage facilities and structures are lacking on all Corps dams in the ACT, which has long been a concern of the Service. Downstream passage in particular can be facilitated by appropriate timing and volume of water releases over spillways and through locking chambers. The Corps has an opportunity to help restore and maintain connectivity of aquatic habitats in the ACT by developing and implementing safe and effective means for upstream and downstream passage.

Ongoing studies determining the effectiveness of using attraction flows and opening of lock gates to allow fish passage should continue, and may result in significant benefits for some species of fish. However, genetic isolation of aquatic organisms, further loss of native biotic diversity, and a trend toward environmental degradation is likely to continue as the landscape of the ACT Basin becomes more developed. We would like to see a cost benefit analysis comparing the operation and maintenance of the current navigational channel and system of locks and dams on the Alabama River versus the costs and economic benefits associated with maintaining the same system for maximum environmental benefits. We suggest that the DEIS at minimum should consider the alternative of operating locks to maximize connectivity of river reaches for aquatic organisms. A summary of the number of commercial barges and other craft that have and are currently utilizing the navigational system should be made available as part of the DEIS.

3.0 REACH DESCRIPTIONS

This section describes target resources present and historically present, objectives, and information needs for river reaches of the ACT in Alabama and Georgia.

3.1 Mobile Bay Delta to Claiborne Lock and Dam (L&D)

3.1.1 River Reach General Description

The lower 81-mile reach of the Alabama River from Claiborne L&D to its mouth flows entirely within the East Gulf Coastal Plain before joining the lower Tombigbee River to form the Mobile River and the biologically rich Mobile-Tensaw Delta. This reach drains an area of low-relief topography consisting of broad, rounded ridges and V-shaped valleys of sand and clay and is highly influenced by releases from upstream impoundments.

3.1.2 Species

Fishes: Alabama shad, Alabama and Gulf sturgeons, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, southern walleye, and ironcolor shiner are species of Federal/State interest that likely continue to inhabit this reach of the Alabama River (Mettee and Shepherd 2001; Mettee et al. 1996; Boschung and Mayden, 2004). However, populations of many of these species have been significantly impacted by Claiborne L&D that is blocking or hindering access to upstream spawning and feeding areas, particularly those species requiring long migrations to complete portions of their life cycle (e.g., Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Other freshwater species of sportfishing interest include the black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, this reach supported the Alabama moccasinshell, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, southern acornshell, southern combshell, southern pigtoe, stirrupshell, rayed creekshell, heavy pigtoe, Alabama pearlshell, black sandshell, tulotoma snail, cylindrical lioplax, painted rocksnail, and upland combshell. Recent dive records from numerous locations in this reach indicate that the inflated heelsplitter, heavy pigtoe, spotted rocksnail and tulotoma snail are the only target species surviving in this reach (USFWS Alabama Field Office data). Important commercial mussel beds also occur within this reach (Hartfield and Garner 1998).

Reptiles: The Alabama red-bellied turtle, alligator snapping turtle, and Mississippi diamondback terrapin are restricted to the lower reaches of the Alabama River in Baldwin County and the Mobile Bay/Delta, Patterns of natural flow variability created the ecologically-rich habitats where these species have survived for millennia.

Plants: Georgia rockcress occurs on the steep upper banks of this reach of the Alabama River, and may rely on flooding to help reduce competition from other vegetation (USFWS Alabama Field Office data). High flow events that scour river bluffs are likely beneficial to this plant.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.1.3 Objectives

Restore federally protected resident and migratory aquatic species to historic abundances in suitable remaining riverine habitats.

3.1.3.1 Instream flow

The flow regime in this reach is affected by peaking hydropower generation/flood control operations to some extent by the 15 upstream dams in the Alabama, Coosa and Tallapoosa Rivers, but a greater impact comes from the one or more pulse flows per day from hydropower peaking flows from Corps-operated turbines at Millers Ferry and R.F. Henry L&Ds (Braun 2004; see Figure 1). Operational guidelines for maintaining flows in this reach have largely focused on ensuring navigation capabilities for a very small number of commercial barges. This is facilitated in part by a 1972 agreement, commonly referred to as the "Forty-six Forty rule" describing an agreement between the Corps and Alabama Power Company (APC) to release a 7-day average of 4640 cfs from APC projects to maintain a 9-foot water elevation in the navigation channel of the Alabama River. However, downstream there are other significant commercial and ecological considerations: the frequency, timing and volume of freshwater released from upstream Corps dams have a profound impact on the ecology of the Mobile Bay and Mobile-Tensaw Delta, and are important factors for commercial and recreational fisheries in the Bay, including those for shrimp, blue crab and oyster (Braun 2004). The pattern of natural freshwater inflow into the Mobile Bay/Delta is characterized by being highly variable at multiple time scales. One of the flow parameters most affected by upstream water management is the loss of extreme low flow events. Braun (2004) estimated that flows lower than 2700 cfs would naturally occur below Claiborne Dam on average about every ten years, but now are likely to occur only every 60 years. Freshwater inflow significantly affects many important ecological processes including the shaping of bottom and bank habitat, inundation and exposure of habitat to air, salinity and water temperature gradients, circulation and distribution of nutrients and massive quantities of organic matter, and residence time of water within embayments (Braun 2004). Therefore, changes in the magnitude, timing and duration of flood and low-flow events, mediated in part by Corps dams, are a major factor in ecological maintenance and succession in the Bay and Delta. Maintaining a pattern of natural freshwater inflow into the Mobile Bay/Delta is therefore highly desirable from an economic as well as an ecological perspective.

3.1.3.2 Water quality

The Alabama River from the Mobile-Tensaw Delta to Claiborne L&D upstream has an ADEM stream use classification of fish and wildlife (ADEM 2000).

Dissolved oxygen

The water use classification for this reach has a 5.0 milligrams per liter (mg/L) DO standard except under extreme conditions due to natural causes, when it may range between 4.0 mg/L and 5.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

Recent water quality data indicate that DO concentrations have fallen below the state DO standard (5 mg/L) in the tailwaters of Claiborne L&D during the summer months, occasionally for days at time, but more commonly for several hours each day (USFWS Alabama Field Office file data, 2000-2002; ADEM preliminary data 2008-2009).

3.1.4 Habitat protection

Navigational dredging is a concern in this reach of the Alabama River. Dredging removes shoal habitats in river channels and changes natural patterns of erosion and deposition potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner, 1998). Land use practices along the mainstem of the Alabama River, as well as its tributaries, can degrade aquatic habitats critical to southern walleye and other fish species (USFWS 2006), and should be considered in Corps dam and reservoir operations.

In addition to dredging, impacts from nonpoint source pollution are significant. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under National Pollution Discharge Elimination System (NPDES) permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agricultural (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment) activities (AL Clean Water Partnership (CWP) 2005).

Priority sub-basins: Important tributaries that help maintain genetic flow and act as refugia in this reach include the Little River, Pine Log Creek, and Reedy/Little Reedy/Sandy Hill Creeks (Alabama Comprehensive Wildlife Conservation Strategy (CWCS) 2005). Flow parameters need to ensure connectivity with these streams.

Designated Critical Habitat: Critical habitat for the Alabama sturgeon was designated in 2009 in this reach (USFWS 2009). The only Alabama sturgeon captured in the past decade was caught in the tailwaters of Claiborne L&D in 2008, reinforcing the fact that the dam is a barrier to an extremely rare (but formerly abundant) species, and that the ecological integrity of the lower Alabama River is essential for keeping this species from becoming extinct.

3.1.5 Aquatic Organism Passage

Since 1969, the Claiborne L&D has impeded upstream passage of most, if not all, diadromous and migratory freshwater fish species under all but the highest spring flows (USACE 2000). Other than the occasional boat lockage or travel over the spillway, Claiborne L&D does not provide any means of upstream or downstream fish passage. Research conducted by the Geologic Survey of Alabama (GSA) indicates that a flow of 80,000 cfs is required to inundate the spillway structure (USFWS 2006). This occasionally occurs between February and April (USGS 2004). Contingent upon the timing of these flows, some stronger swimming fishes, like the blue sucker, appear to be capable of swimming upstream over the spillway. However, most fishes cannot swim upstream to historical spawning areas.

Use of the lock holds some promise for providing upstream fish passage. Recent Corps/Service studies indicate that slight modification in locking procedures can greatly increase the number of fish species passed. A 30-foot headwall in the lock might, however, limit the passage of some species. On-site consultation with Ben Rizzo, the Service's Senior Fishway Engineer, revealed that addition of a fish lift or vertical slot fishway would greatly enhance passage to a wider variety of species. Mr. Rizzo stated that these types of fishways can pass sturgeon. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan. Mettee et al. (2005) suggests that more than 35 fish species could benefit from passage improvements at Claiborne and Millers Ferry L&Ds. The fisheries program at Auburn University, in cooperation with the Corps, is beginning research on the efficacy of alternative locking procedures, including the use of pumps for attraction flows. We encourage the Corps to continue to facilitate this research.

Research by GSA also indicates that a variety of aquatic species freely pass downstream over the fixed-crest spillway of Claiborne L&D (Mettee et al. 2005), though the losses associated with this are unknown. Sturgeon species are not likely to utilize spillways for downstream travel, and are effectively trapped between dams under most current conditions.

3.1.6 River Reach Research Needs

- Implement and develop monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Service and AABC, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any species that has been identified as a primary host for a targeted mussel (USFWS 2005a).
- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.
- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.2 Alabama River from Claiborne L&D to Millers Ferry L&D

3.2.1 River Reach General Description

This 60-mile reach of the Alabama River is contained entirely within the East Gulf Coastal Plain Province and encompasses Claiborne Reservoir, a 5,930-acre impoundment on its southern end (USACE 2001). Claiborne Reservoir is essentially a run-of-river impoundment that provides a 9-foot navigation channel up to Millers Ferry L&D. Unique habitats have developed in this reach as streamflow cuts down through the alluvial sediments to expose the limestone underlayment (Mettee et al. 1996). This results in streambeds with upland characteristics within the Coastal Plain (Mettee et al. 1996). The upper part of this reach experiences hydropower-influenced flows from the Millers Ferry hydropower facility.

3.2.2 Species

Fishes: Alabama shad, Alabama sturgeon, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, southern walleye, and ironcolor shiner are species of Federal/State interest that likely inhabit this reach of the Alabama River (Mettee et al. 1996; Boschung and Mayden 2004). Populations of many of these species have been significantly impacted by Claiborne L&D by being blocked or hindered from access to upstream spawning areas, particularly for those species that require long migrations to complete a part of their life cycle (e.g. Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, Gulf sturgeon, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Freshwater species of sportfishing interest that inhabit this reach include the striped bass, black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, southern acornshell, southern combshell, southern pigtoe, upland combshell, stirrupshell, rayed creekshell, heavy pigtoe, black sandshell, tulotoma snail, painted rocksnail, and cylindrical lioplax occurred in this reach. It is likely that the inflated heelsplitter, heavy pigtoe, and spotted rocksnail are still extant. Dive sampling in 2009 shows the tulotoma snail to still be extant (USFWS Alabama Field Office data). Valuable commercial mussel beds also occur within this reach (Hartfield and Garner 1998).

Plants: Georgia rockcress occurs on the steep upper banks of this reach of the Alabama River, and may rely on flooding to help reduce competition from other vegetation (USFWS Alabama Field Office data). High flow events that scour river bluffs are likely beneficial to this plant. Botanists have long noted that the bluffs found along and above Claiborne L&D are botanically very species-rich, with fluvial geomorphic processes influencing short and long-term vegetation dynamics (Bill Finch, The Nature Conservancy, pers. comm. 2010)

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.2.3 Objectives

The Corps has an opportunity to protect reservoir fisheries and water quality, as well as restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats.

3.2.3.1 Instream flow

The flow regime in this reach is affected by peaking hydropower generation at Millers Ferry L&D as well as peaking hydropower generation and flood control operations at 14 other upstream dams in the Alabama, Coosa and Tallapoosa Rivers. Currently, there are no minimum flows required downstream of Miller's Ferry L&D, although there is an agreement with APC to provide enough water to maintain a navigation channel for a very small number of commercial barges.

3.2.3.2 Water quality

The Alabama River from Claiborne L&D upstream to the Frisco Railroad crossing has ADEM's stream use classifications of swimming, and fish and wildlife (ADEM 2000). From the Frisco Railroad crossing upstream to river mile 131 the reach is classified as fish and wildlife (ADEM 2000). From river mile 131 upstream to Millers Ferry L&D the river is classified as public water supply (ADEM 2000). A portion of the main channel in this reach is included on the state's 303(d) listed waters due to organic enrichment/low dissolved oxygen and nutrients as a result of dam construction, industrial discharges, flow regulation/modification, non-irrigated crop production, and pasture grazing (ADEM 2002). ADEM (2004) lists Claiborne Lake as eutrophic.

Dissolved oxygen

Alabama water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, DO may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should never be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from June-September 1983 revealed that the DO standard was met on all occasions in the Millers Ferry L&D tailrace, although August data closely approached the standard's limits (ADEM 1984). Comparisons of pre- and post-impoundment DO data indicate an 18% decline in average DO concentration (6.6 mg/L pre-impoundment to 5.4 mg/L post-impoundment) for August (ADEM 1984). Downstream effects of flow interruption and lower DO concentrations caused one major discharger to resort to a higher treatment, hold-and-release system for effluent discharge (ADEM 1984).

More recent water quality data indicate that DO concentrations fell below the state instantaneous DO standard (4 mg/L) in the tailwaters of Millers Ferry L&D during the summer months (FWS, Alabama Field Office file data, 2000-2002; ADEM preliminary data 2008-09).

3.2.4 Habitat protection

Navigational dredging is a concern in this reach of the Alabama River. Dredging removes shoal habitats and changes natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along the mainstem of the Alabama River, as well as its tributaries, can degrade aquatic habitats critical to southern walleye and other fish species.

In addition to dredging, nonpoint source pollution is a significant concern to be considered in Corps water management operations. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under NPDES permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta and river ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agriculture (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment and petroleum), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment and heavy metals) (AL CWP 2005).

Priority sub-basins: An important tributary that helps maintain genetic flow and acts as a refugia in this reach includes Limestone Creek (CWCS 2005). Flow parameters need to ensure connectivity with this stream.

Designated Critical Habitat: Critical habitat has been designated in this reach for the Alabama sturgeon, an extremely rare fish once found in abundance (USFWS 2009). The update to the WCM should consider research and monitoring to determine flow patterns that could help keep the species from becoming extinct.

Potential Reintroduction/Augmentation Site and Suitable Species: The Alabama River has been identified as a potential reintroduction/augmentation site for the inflated heelsplitter, orange-nacre mucket, heavy pigtoe, southern clubshell, and stirrupshell (Hartfield et al. 2010).

3.2.5 Aquatic organism passage

Other than the occasional boat lockage and traversing of the spillway, and some limited experiments with attraction flows and lock openings, Millers Ferry L&D does not currently allow any means of fish passage. However, modification of lock operation may hold some potential for providing upstream passage to migratory species. As shown at Claiborne L&D, Millers Ferry also has the potential to pass large numbers of riverine fishes, some of which are listed under the ESA. Under extremely limited sampled conditions, Mettee et al. (2005) collected 10 species in the Millers Ferry lock chamber in May 2004 by providing an attraction flow. Installation of an additional fishway device (e.g., a vertical slot fishway or fish lift) may also be required to help pass a wider variety of species, take advantage of attraction flows elsewhere below the lock and dam, and provide passage to another portion of the channel. Attraction flows stemming from hydropower generation could be problematic for fish passage since these occur downstream of the lock and dam and could draw migratory species away from the intended path of passage. Some type of mechanism to direct fish away from this area may also be warranted. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan.

Mettee et al. (2005) suggests that more than 35 fish species could benefit from passage improvement at Claiborne and Millers Ferry L&Ds, not to mention opening-up access to the Cahaba River.

Downstream passage over the spillway at Millers Ferry L&D is possible for some migratory fish; however, turbine entrainment could have a severe negative impact on downstream migration. Screening of draft tube intakes and/or other devices that direct fish away from the turbines would be necessary to protect downstream migrants. A Corps plan to install debris diverters for the draft tubes has the potential of providing not only turbine protection, but also providing protection to downstream migrants. Modification of this device to protect migratory species should be seriously considered.

3.2.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.
- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).
- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.
- Explore and implement opportunities to augment/reintroduce mollusks and fishes into appropriate habitats.
- Evaluate the effects of channelization and reservoir flowage on adjacent side-channel, shallow water, oxbow lake-type habitats. These areas provide important nursery areas for many fish species, and are an important foraging resource for listed species such as the wood stork. Flood events and flow patterns prior to dam construction maintained the sediment dynamics necessary for relatively stable, shallow water side-channel floodplain features, but reservoir flows and channelization may have now changed floodplain sediment dynamics to the point where many of these shallow water side channels can only be maintained through repeated dredging of their inlets (Stan Cook, ADCNR, pers. comm. 2010).
- Develop Geographic Information System (GIS) databases that identify, characterize (e.g., bathymetry, current velocity, and substrate), and map stable riverine habitats.
- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.3 Alabama River from Millers Ferry L&D to R.F. Henry L&D

3.3.1 River Reach General Description

The section of the Alabama River between Millers Ferry and R.F. Henry L&D is 103 miles long and is contained entirely within the East Gulf Coastal Plain Province. The reach encompasses Dannelly

Reservoir, a 17,200-acre impoundment formed by Millers Ferry L & D. Dannelly Reservoir is essentially a run-of-river impoundment that provides a 9-foot navigation channel up to R.F. Henry L & D. Although managed as a run-of-the-river impoundment, Millers Ferry L & D has a hydroelectric generating capacity of 75 MW (ADEM 1984), and hydropower peaking flows are experienced by aquatic species downstream of both Millers Ferry and R. F. Henry dams.

3.3.2 Species

Fishes: Alabama shad, Alabama sturgeon, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, and southern walleye are species of Federal/State interest that likely inhabit this reach of the Alabama River (Mettee et al. 1996; Boschung and Mayden 2004). Populations of many of these species have been significantly impacted downstream by Claiborne L&D by blocked or impaired access to upstream spawning areas, particularly for those species that require long migrations to complete a part of their life cycle (e.g. Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, Alabama sturgeon, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Freshwater species of sportfishing interest that inhabit this reach include the black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, painted rocksnail, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, rayed creekshell, southern combshell, stirrupshell, black sandshell, and cylindrical lioplax occurred in this reach. It is likely that the inflated heelsplitter and spotted rocksnail still occur here, and recent dive sampling indicates that the heavy pigtoe, southern clubshell, and tulotoma snail are still extant in this reach (USFWS Alabama Field Office data; Pierson 1991; ADCNR unpublished data 2009). This reach contains several locations of concentrated densities of commercial mussel species (Hartfield and Garner 1998).

Plants: Georgia rockcress and Price's potato-bean occur on and near the banks of this reach of the Alabama River (USFWS Alabama Field Office data). Georgia rockcress likely benefits from flood-induced scour that reduces competition from other plants.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.3.3 Objectives

The Corps can help to protect reservoir fisheries and water quality as well as restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats.

3.3.3.1 Instream flow

The instream flow regime in this reach is affected by hydropower generation at R.F. Henry L&D as well as peaking hydropower generation/flood control operations at 13 other dams upstream in the Coosa and Tallapoosa Rivers. Currently, there are no required minimum flows downstream of R.F. Henry L&D, although there is an agreement with APC to release at least 4640 cfs from their upstream projects to provide a 9-foot navigation channel in the river.

3.3.3.2 Water quality

The Alabama River from Millers Ferry L&D upstream to Blackwell Bend has ADEM's stream use classification of swimming and fish and wildlife (ADEM 2000). From Blackwell Bend upstream to Henry L&D, the reach is classified as fish and wildlife (ADEM 2000). ADEM (2004) lists Dannelly Reservoir as eutrophic.

Dissolved oxygen

Water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from June-September 1983 revealed that the DO standard was met on all occasions in the Henry L&D tailrace. However, comparisons of pre- and post-impoundment DO data indicate a 35% decline in average DO concentration (7.1 mg/L pre-impoundment to 4.6 mg/L post-impoundment) for August (ADEM 1984). While greater waste load demands were experienced in recent years, ADEM (1984) conceded that water quality effects from impoundment and power generation were evident.

DO concentrations occasionally fall below the state DO standard (4 mg/L) in the tailwaters of Henry L&D (USFWS Alabama Field Office data, 2000-2002; ADEM preliminary data 2008-09).

Forebay profiles taken at the Millers Ferry L&D from June-September 1983 showed a moderate tendency toward DO stratification in June and July (ADEM 1984). Stratification was of such a moderate nature that DO concentrations stayed above 4.0 mg/L all the way to the bottom of the forebay (about 55 feet); the rest of the sampling period concentrations were similar throughout the water column (ADEM 1984). As at other projects where forebay and tailrace DO concentrations were above the standard, the shorter reservoir retention period probably accounts for the more favorable water quality (ADEM 1984).

3.3.4 Habitat protection

Dredging has removed shoal habitats and changed natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along tributary streams can also degrade aquatic habitats critical to southern walleye and other fish species (USFWS 2006).

In addition to dredging, impacts from nonpoint source pollution are significant and need to be taken into account during dam and reservoir operations. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under NPDES permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta and river ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agricultural (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment) activities (ALCWP 2005).

Priority sub-basins: Important tributaries that help maintain genetic flow and act as refugia in this reach include Bogue Chitto Creek, Big Swamp Creek, Cahaba River, Chilatchee Creek, Dry Cedar Creek, Little Mulberry Creek, and Mulberry Creek (ACWCS 2005; Bogan and Pierson 1993b). Flow parameters need to ensure connectivity with these streams.

Designated Critical Habitat: The Alabama River from the confluence of the Cahaba River (Alabama RM 198.1) upstream to the confluence with Big Swamp Creek (RM 183.5) is designated critical habitat for the southern clubshell and orange-nacre mucket. Bogue Chitto Creek from its confluence with the Alabama River (RM 169.8) upstream to U.S. Highway 80 is also designated critical habitat for the southern clubshell, Alabama moccasinshell, and orange-nacre mucket (USFWS 2004). Critical habitat for the Alabama sturgeon has been designated in the Alabama River to below R.F. Henry L&D, and in the Cahaba River to Centreville (USFWS 2009). The WCM update should focus on developing and implementing a flow regime that protects and enhances habitat for these species.

Potential Reintroduction/Augmentation Site and Suitable Species: The Alabama River has been identified as a potential reintroduction/augmentation site for the inflated heelsplitter, orange-nacre mucket, heavy pigtoe, southern clubshell, and stirrupshell (Hartfield et al. 2010).

3.3.5 Aquatic organism passage

Millers Ferry L&D is an impediment to upstream fish passage by migratory species, such as Alabama sturgeon, Gulf sturgeon, Alabama shad, paddlefish, smallmouth buffalo, southern walleye, and blue sucker. Downstream passage over the Henry L&D spillway is possible for some fish species; however, turbine entrainment could have a severe negative impact on downstream migration. Screening of draft tube intakes and/or other devices that direct fish away from the turbines is necessary to protect downstream migrants.

Modification of lock operations holds potential for providing upstream passage to migratory species. As has been shown at Claiborne L&D, relatively minor modifications in locking procedures can greatly increase upstream passage for some species. However, installation of a fishway device (e.g., a vertical slot fishway or fish lift) would help pass a greater abundance and wider variety of species through this facility. Downstream attraction flows stemming from hydropower generation could be problematic for fish passage, so some type of mechanism to divert migratory fish away from this area may also be warranted. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan.

3.3.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.
- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).
- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Alabama Aquatic Biodiversity Center, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any other species that has been identified as a primary host species for a targeted mussel (USFWS 2005b).

- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.

- Examine the effects of channelization and reservoir flowage on silting in of the inlets of adjacent side-channel, shallow water habitats. These areas provide important nursery areas for many fish species, and are an important foraging resource for listed species such as the wood stork. Flood events and flow patterns prior to dam construction maintained the sediment dynamics necessary for a relatively stable side-channel floodplain feature, but reservoir flows and channelization may have now changed floodplain sediment dynamics to the point where many of these shallow water side channels can only be maintained through repeated dredging of their inlets (Stan Cook, ADCNR pers. comm. 2010).

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.4 Alabama River from R.F. Henry L&D to Jordan/Bouldin Dams (Coosa River)

3.4.1 River Reach General Description

This reach contains the transition between the portion of the ACT Basin managed by the Corps and the section controlled primarily by dams operated by Alabama Power Company (APC) on the Coosa and Tallapoosa Rivers. The lower dam on this reach, R.F. Henry Dam, is operated by the Corps, while Jordan and Bouldin Dams are operated by APC. Ecological issues described below for this reach will need to be addressed by both the Corps and APC.

This 80-mile reach of the Alabama River is contained entirely within the East Gulf Coastal Plain Province and includes Woodruff Reservoir, a 12,510-acre impoundment formed by R.F. Henry L&D. Woodruff Reservoir is essentially a run-of-the-river impoundment that provides a 9-foot navigation channel up to Montgomery. Although managed as a run-of-river impoundment, R. F. Henry L & D does have a hydroelectric generating capacity of 68 MW (ADEM 1984). Aquatic species downstream of R.F. Henry are affected by hydropeaking flows not only from the R.F. Henry turbines, but also from the dams upstream on the Coosa and Tallapoosa Rivers. Another feature of this reach is the 5-mile long tailrace canal from Bouldin Dam that bypasses the main channel and enters the Coosa River 12 miles downstream of Jordan Dam. The tailrace downstream of Jordan Dam receives a continuous minimum flow ranging from 2,000 cfs during the summer-fall-winter months, to 4,000 cfs during the spring months. Due to this minimum flow, the Jordan tailrace has developed into a spotted bass fishery, and also offers one of the best restoration opportunities for mollusks and fishes in the entire Mobile River Basin. This unique area is located over a geologic formation known as the Fall Line, which is the transition zone between high gradient upland streams and low gradient coastal plain streams. The stretch of the Coosa upstream of the Fall Line was historically characterized by a series of shoals collectively called the Coosa Falls; however, the rivermen of the late 1800s often used more colorful terms for these areas like, the Narrows, Devil's Race, Butting Ram Shoals, Hell's Gap, and the Devil's Staircase -- most of which are now inundated by Jordan, Mitchell, and Lay reservoirs (Jackson 1995). These names were due in part to the rapid change in elevation the Coosa experienced over its last sixty miles before crossing the Fall Line and joining the Tallapoosa River near the town of Wetumpka. The last exposed remnant of this geologic formation is the stretch between Jordan Dam and Wetumpka known as Moccasin Shoals.

3.4.2 Species

Fish: Historically, the Alabama shad, Alabama sturgeon, American eel, and Gulf sturgeon occurred in this reach (Mettee et al. 1996; Boschung and Mayden 2004); however, populations of these species have been severely impacted by Claiborne, Millers Ferry, and R.F. Henry Dams which block or hinder fish access to upstream spawning areas. The southeastern blue sucker, highfin carpsucker, paddlefish, quillback, river redhorse, southern walleye, smallmouth buffalo, and striped bass are species of federal/state interest that continue to inhabit the mainstem and/or tributaries of this reach (Mettee et al. 1996; Boschung and Mayden 2004). Other freshwater species of state interest include black basses (e.g., the Jordan tailrace is recognized as a world class spotted bass fishery), crappie, catfish, freshwater drum and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, fine-lined pocketbook, triangular kidneyshell, Coosa moccasinshell, southern pigtoe, orange-nacre mucket, ovate clubshell, southern purple lilliput, southern clubshell, southern combshell, stirrupshell, delicate spike, Alabama spike, black sandshell, Coosa creekshell, cylindrical lioplax, interrupted rocksnail, lacy elimia, painted rocksnail, teardrop elimia, cobble pebblesnail, flat pebblesnail, and spotted rocksnail occurred in this reach, many of which have been extirpated or are presumed extinct (Johnson 2002). Recent collections indicate that the fine-lined pocketbook may exist in this reach, along with the largest population of the tulotoma snail, which occurs in a reach approximately 3.5 miles downstream of Jordan Dam (Bogan and Pierson 1993a; Johnson 2002). A 1995 study reported a stable and healthy population of over 109 million tulotoma snails inhabiting this reach (Christman et al. 1995). Christman et al. (1995) also documented an increase in shoreline habitat use by the snail that was attributed to increased habitat availability resulting from the implementation of continuous minimum flow releases at Jordan Dam. The interrupted rocksnail (previously extirpated in Alabama) was reintroduced into the reach in 2003 after not being collected for nearly 50 years. This reach also supports one of the two known populations of the rough hornsnail (Mirarchi et al. 2004).

Plants: Georgia rockcress and Price's potato-bean occur on and near the banks of this reach of the Alabama River (USFWS Alabama Field Office data). Georgia rockcress likely benefits from flood-induced scour that reduces competition from other plants.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.4.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, and reduce the effects of hydropower-induced flow pulses from upstream dams. The Corps can also help restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats. The area downstream of Jordan Dam to Wetumpka has been identified as an important reach for the augmentation/reintroduction of several target species (Hartfield et al. 2010; Johnson 2002).

3.4.3.1 Instream flow

The instream flow regime in this reach is affected by impoundment at R.F. Henry L&D, hydropower generation at Jordan and Bouldin Dams, as well as by peaking hydropower/flood control operations at 11 other upstream dams in the Coosa and Tallapoosa River basins in Alabama and Georgia. From 1928, the first year of operation for Jordan Dam, until 1992, no allowances were made for minimum flows in its tailwaters. Flow was exclusively determined by hydroelectric demand, reservoir spillage, and prevailing weather patterns. In fact, beginning in 1967 with the completion of the Bouldin Dam, discharge through this dam's 5.5-mile tailrace cut-off bypassed approximately 12 miles of river below Jordan Dam for extended periods. This situation basically continued until 1992 when APC, as a condition of Federal Energy Regulatory Commission (FERC) relicensing, was required to provide a minimum instream flow to the bypassed mainstem of 2,000 cfs in the summer-fall-winter months and 4,000 cfs during the spring months (APC/KA 2000a). Further operational modifications were subsequently made to allow for short periods of increased flow (up to 10,000 cfs) to enhance kayaking, whitewater rafting, and fishing (APC/KA 2000a). At present, adjustments to the minimum flow are made using a ramping schedule that decrease flow at the rate of about 67 cfs or 133 cfs/day (APC/KA 2000a) to avoid stranding aquatic species. Minimum releases were chosen as a management approach to reduce the adverse effects of intermittent and/or peaking discharges from Jordan and Bouldin Dams. These minimum flows have had a significant positive effect on water quality and the aquatic community downstream of Jordan Dam.

3.4.3.2 Water quality

The Alabama River from Henry L&D upstream to Pintlala Creek and Catoma Creek has ADEM's stream use classification of fish and wildlife and partially supports its designated use (ADEM 2004). Causes for impairment are listed as organic enrichment, and DO. The entire Bouldin Tailrace Canal and the Coosa River from its mouth to Jordan Dam his classified for fish and wildlife (ADEM 2000).

Dissolved oxygen

Water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from May-September 1983 revealed that the DO standard was not met on two occasions in the Jordan Dam tailrace during July and August (ADEM, 1984). On these occasions DO levels were extremely low (1.1 mg/L and 1.6 mg/L, respectively). However since a continuous minimum flow was implemented in 1994 and continuous monitoring began in 1995, this standard is rarely violated (APC 2005). Recent water quality data collected by APC between 1995 and 2003 (APC 2005) indicates that the Jordan Dam tailrace is typically in compliance with the required state standard for DO (Figure 2).

Forebay profiles taken at the R.F. Henry Lock and Dam from June-September 1983 showed that a very slight DO stratification occurs in July and August, but subsides by September (ADEM 1984). Stratification was so slight in nature that DO concentrations stayed above 3.5 mg/L to the bottom of the forebay (about 55 feet); the rest of the sampling period concentrations were similar throughout the water column (ADEM 1984). As at other projects where forebay and tailrace DO concentrations were above the standard, the shorter reservoir retention period probably accounts for the more favorable water quality (ADEM 1984).

Erosion and sedimentation

Water releases through the Bouldin Dam into the Bouldin Tailrace Canal are causing excessive erosion and measures should be taken to implement a comprehensive bank stabilization strategy in this area (ADCNR 2000).

3.4.4 Habitat protection

Dredging has removed shoal habitats and changed natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along tributary streams can degrade aquatic habitats critical to southern walleye and other fish species.

Priority sub-basins: Catoma Creek and Pintlala Creek are important tributaries for genetic flow and refugia in this reach (ACWCS 2005). Flow parameters should maintain connectivity with these streams.

Designated Critical Habitat: The Coosa River from Alabama State Highway 111 upstream to Jordan Dam is designated critical habitat for the southern clubshell, ovate clubshell, southern acornshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, Coosa moccasinshell, southern pigtoe, and fine-lined pocketbook (USFWS 2004). Critical habitat for the interrupted rocksnail and rough hornsnail has also been proposed for this area.

Potential Reintroduction/Augmentation Site and Suitable Species: The mainstem of the Coosa River from Wetumpka upstream to Jordan Dam have been identified as a potential reintroduction/augmentation site for the Alabama moccasinshell, fine-lined pocketbook, ovate clubshell, southern acornshell, southern clubshell, southern pigtoe, triangular kidneyshell, upland combshell, Coosa moccasinshell, Alabama spike, delicate spike, tulotoma snail, cylindrical lioplax, flat pebblesnail, painted rocksnail, interrupted rocksnail, and lacy elimia (Hartfield et al. 2010).

3.4.5 Aquatic organism passage

Modification of lock operations holds potential for providing upstream passage to migratory species. As has been shown at Claiborne Lock and Dam, relatively minor modifications in locking procedures can greatly increase upstream passage for some species. However, installation of a fishway device (e.g., a vertical slot fishway or fish lift) would help pass a greater abundance and wider variety of species through this facility.

3.4.6 River Reach Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Alabama Aquatic Biodiversity Center, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any other species that has been identified as a primary host species for a targeted mussel (USFWS 2005b).

- Determine if fish host restoration is needed to sustain mussel restoration efforts (Johnson 2002). Fish surveys conducted in the Jordan tailrace by APC in 1997 indicated that the site apparently lacks large populations of many common darters and minnows that are known mussel hosts.

- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.5 Coosa River from Weiss Dam to Mouth of Etowah River

3.5.1 River Reach General Description

The Coosa River, from its origin at the confluence of the Oostanaula and Etowah Rivers in Georgia, flows in a westerly direction 60 miles to Weiss Dam, which is operated by APC (GAEPD 1998). Resource management issues in this reach are shared by the Corps and APC. This reach of the Coosa River is contained within the Valley and Ridge and Cumberland Plateau Provinces and includes Weiss Reservoir, a 30,200-acre impoundment on its southern end (APC/KA 2000b). Weiss Reservoir has 447 miles of shoreline and a maximum depth of 62 feet (APC 1995b). Weiss Dam is operated for peaking hydroelectric production with a generating capacity of 88 MW (ADEM 1984). Additionally, this reach contains the remnants of the Mayo's Bar Lock and Dam, a former Corps project constructed in the early 1900's about 8 miles downstream of Rome, Georgia.

3.5.2 Species

Fish: Alabama shad, American eel, Gulf sturgeon, Alabama sturgeon, lake sturgeon, freckled madtom, trispot darter, and the saddleback darter are thought to have occurred in the Coosa River and/or its tributaries, but have apparently been extirpated. The Southeastern blue sucker and river redhorse occur elsewhere in the Coosa River drainage but have been apparently extirpated from this reach (Freeman et al. 2005; Burkhead et al. 1997). The blue shiner, flame chub, lined chub, Coosa chub, burrhead shiner, river redhorse, stippled studfish, holiday darter, coldwater darter, goldstripe darter, rock darter, freckled darter, river darter, southern walleye, smallmouth buffalo and striped bass (self-sustained population) are species of Federal/State interest that continue to occur within the Coosa River and/or its tributaries (Mettee et al. 1996; Boschung and Mayden 2004; Pierson 1998; Burkhead et al. 1997; Freeman et al. 2006). The lake sturgeon is a species that has been recently reintroduced in the Coosa River in Georgia. Other freshwater species of sportfishing interest that inhabit riverine and lacustrine habitats in this reach include black basses, crappie, catfish, freshwater drum and sunfishes (USFWS 2006).

Mollusks: Historically, approximately 36 freshwater mussel species were known from the Coosa River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Coosa River and its tributaries included the Alabama spike, delicate spike, Alabama moccasinshell, cylindrical lioplax, fine-lined pocketbook, flat pebblesnail, heavy pigtoe, inflated heelsplitter, orange-nacre mucket, , southern acornshell, southern clubshell, southern pigtoe, Georgia pigtoe, triangular kidneyshell, southern purple lilliput, Alabama creekmussel, Coosa creekshell, and upland combshell (Burkhead et al. 1997; Williams and Hughes 1997; USFWS 2000). Recent records indicate that the Coosa moccasinshell is a species of Federal/State interest that continues to occur in tributaries of this reach (USFWS 2000). The southern clubshell and fine-lined pocketbook are still found in the Weiss Bypass channel, the old river channel prior to dam construction. Surveys of the mainstem Coosa River conducted in the late 1990's located live specimens of the flat floater, washboard, paper pondshell, and threehorn wartyback. Shell material of other species was identified for Coosa fiveridge, elephantear, fragile papershell, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, butterfly, and the southern clubshell (Williams and Hughes 1997).

Plants: Harperella and Kral's water plantain are riverine plants that occur within the active channel of major tributaries of this reach. If surveys report these in the Coosa mainstem,flow dynamics could have a major influence on their ability to persist (USFWS 2000).

3.5.3 Objectives

The Corps has an opportunity to help protect reservoir fisheries, as well as restore resident and migratory aquatic species to historic abundances in remaining suitable riverine habitats.

3.5.3.1 Instream flow

Completion of Weiss Dam in 1961 resulted in bypassing flows around a 22-mile section of the mainstem Coosa River (hereafter referred to as "bypass channel"). The bypass channel is an important restoration location for mussels and other aquatic organisms formerly found in abundance in the Coosa River (Herod et al. 2001). Management of upper ACT Basin Corps projects in a manner that meets upstream ecosystem objectives and provides sufficient flows in the Weiss Bypass channel is of critical importance. The bypass channel is also adversely affected by the operation of Weiss Dam which, during peak generation, reverses flow in at least the lower 14 miles of the bypass channel. A continuous minimum flow should be determined and implemented to restore the riverine character of the bypass channel which could be facilitated by installing and using an appropriately-sized turbine or by releasing water through the project's spillway or trash gates (ADCNR 2000). We have recommended that APC, as part of the hydropower license on Weiss Dam, in general provide 10% of Coosa River flow coming into Weiss reservoir for the Weiss Bypass channel. However, this recommendation is only adequate if the Corps releases an adequate amount of water from Allatoona and Carters dams to meet downstream ecological needs.

3.5.3.2 Water quality

The Coosa River from the Weiss Dam powerhouse upstream to Spring Creek has ADEM's stream use classification of public water supply, swimming, and fish and wildlife classifications (ADEM 2000). From Spring Creek to the state line, swimming and fish and wildlife are the applicable classifications (ADEM 2000). The Coosa mainstem between Weiss Dam and the Georgia-Alabama state line is included on the state's 303(d) listed waters as partially supporting state water use classifications due to priority organics, nutrient enrichment and pH from flow regulation/modification and upstream sources (ADEM 2002).

The Coosa River at the Alabama-Georgia state line is classified by the Georgia Environmental Protection Division (GAEPD) for recreation and fishing (GAEPD 2001). From the state line upstream to the confluence of the Etowah and Oostanuala Rivers the classification is fishing (GAEPD 2001). Portions of the Coosa mainstem and Big Cedar Creek are on the Georgia 303(d) listed waters as not supporting its water use classification. This is a result of violations of water quality standards for metals and fecal coliform bacteria (GAEPD 1998).

Dissolved oxygen

Water use classifications for the Alabama portion of this reach require a 5.0 mg/L DO standard at all times; except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

Forebay profiles taken during August and September 1983 showed that Weiss Reservoir experienced temperature stratification, but only slight stratification with respect to DO concentration (ADEM 1984). As a consequence of this slight stratification in 1983, ADEM reported DO concentrations above 2.0 mg/L to a depth of 40 feet (ADEM 1984). The shallow depth of the reservoir and the frequency of generation observed suggests minimal retention times and thus a mixed instead of a stratified reservoir (ADEM 1984). Forebay sampling conducted by APC during June to October of 1990-1999 indicated that Weiss Reservoir may become more stratified than suggested by previous sampling (APC/KA 2000b). APC/KA (2000b) reported a stratification tendency at depths of 15 to 20 feet during mid summer that at times extended for 60 to 90 days. During a number of these stratification periods, DO concentrations were <2.0 mg/L at a depth of 15 feet (APC/KA 2000b).

3.5.4 Habitat protection

Along Weiss Reservoir, considerable natural shoreline habitat has been converted to vertical bulkheads which eliminate shallow shoreline habitat so important to juveniles of many game fish species (ADCNR 2000). The permitting process for shore stabilization should be modified to require other less destructive types of shoreline structures.

Priority sub-basins: Little River is an important tributary for genetic flow and refugia for this reach (ACWCS 2005).

Designated Critical Habitat: There are no areas designated as critical habitat on the existing mainstem of the Coosa in this reach or in any sub-basins, although it should be noted that a portion of the Weiss Bypass Channel is designated critical habitat for the southern acornshell, ovate clubshell, southern clubshell, upland combshell, triangular kidneyshell, Coosa moccasinshell, southern pigtoe and fine-lined pocketbook (USFWS 2004). Maintenance of natural flows through the Weiss Bypass channel will benefit these species

3.5.5 Aquatic organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Local interest in raising the level of the Mayo Bar Lock and Dam (MBL&D) by two feet could however negatively impact striped bass upstream spawning movements from Weiss Reservoir and survival of their eggs and larvae in the Oostanaula River (USFWS 2006). However, if data become available that indicate Weiss Dam adversely affects resident/migratory species because of blockage of movements or entrainment, then fish passage/screening strategies should be developed and implemented.

3.5.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.6 Etowah River from Coosa River to Allatoona Reservoir

3.6.1 River Reach General Description

This approximately 48 mile stretch of the Etowah River flows generally westward from Allatoona Reservoir toward its confluence in western Georgia with the Oostanaula River, where together they form the Coosa River. The Etowah River below Allatoona Dam is contained within the Ridge and Valley Physiographic Province. Allatoona Reservoir is a 19,200-acre impoundment built for flood control, navigation, hydroelectric power and recreation, with a hydroelectric generating capacity of 80 MW (USACE 1998).

3.6.2 Species

Fish: American eel, lake sturgeon, blue shiner, lined chub, emerald shiner, southeastern blue sucker, river redhorse, freckled madtom, chain pickerel, coldwater darter, trispot darter, coal darter, and river darter are thought to have occurred in the Etowah River and/or its tributaries, but have apparently been extirpated The lake sturgeon is a species that has been recently reintroduced in the upper Coosa River Basin in Georgia. The Coosa chub, burrhead shiner, Etowah darter, Cherokee darter, rock darter, , amber darter, and freckled darter are species of Federal/State interest thought to still occur in the Etowah River and its tributaries (Freeman et al. 2006; Freeman 1998; USACE 2000; Burkhead et al. 1997). Surveys have been initiated in 2010 to evaluate persistence and spatial distribution of fishes in the mainstem Etowah River below Allatoona Dam.

Mollusks: Historically, approximately 40-50 freshwater mussel species were known from the Etowah River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Etowah River and its tributaries included the rayed creekshell, Alabama spike, delicate spike, Alabama moccasinshell, cylindrical lioplax, fine-lined pocketbook, flat pebblesnail, southern acornshell, southern clubshell, southern pigtoe, Georgia pigtoe, triangular kidneyshell, Alabama creekmussel, Coosa creekshell, and upland combshell (USFWS 2000, USACE 2000, Burkhead et al. 1997, Williams and Hughes 1997). Surveys have been initiated in 2010 to determine which species are still extant in the

Etowah River below Allatoona Dam. Surveys of the mainstem Etowah River below Allatoona Dam conducted in the late 1990's located live specimens of the fragile papershell and pistolgrip. Shell material of the elephantear was also identified (Williams and Hughes 1997).

3.6.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, instream flow, and reduce the effects of hydropower-induced flow pulses from upstream dams. The Corps also has an opportunity and responsibility to protect reservoir fisheries, as well as restore resident and some migratory aquatic species to historic abundances in remaining suitable riverine habitats.

State and federal agency representatives, private landowners, business owners, and conservation groups held a public stakeholder meeting at Red Top Mountain State Park, Georgia on August 8, 2009. The intent of this meeting was to openly discuss and develop a vision for upper ACT Basin water management, with the explicit intent to inform our collective efforts to update the WCM. Radio announcements, newspaper announcements, and fliers were distributed to advertise the meeting and harness public interest and participation. The Corps was invited to attend this meeting but no Corps representative was sent. Stakeholders at the meeting 1) agreed that water management in the upper ACT could be improved to benefit the multiple water uses and 2) developed a list of fundamental and means objectives for water management below upper ACT Corps projects (Figure 3). The Corps needs to engage this diverse group of stakeholders because this effort is broad in scope, encompasses multiple stakeholders, acknowledges multiple demands on water resources, and is intended to improve the WCM and flow management. It was generally agreed that an adaptive management approach to flow management would be beneficial.

3.6.3.1 Instream flow

The instream flow regime in this reach is affected by hydropower/flood control operations at Allatoona Dam. The hydropower facility generates power between 2 and 6 hours during normal operations each weekday. Power is generated on weekends as necessary, but generally only the minimum flow of 250 cfs (320 cfs with leakage) is released. Flow instability from hydropower fluctuations between 320 cfs and 7,500 cfs likely affects recruitment and reproduction of many fish species (*sensu* Freeman 2001), including those acting as host species for freshwater mussels (Layzer and Crigger 2001; Watters 2000). Providing longer periods of stable flow during critical spawning and rearing seasons should increase opportunities for recruitment and reproduction of freshwater organisms (*sensu* Freeman 2001). The minimum flow requirement at Allatoona Dam (250 cfs) was developed based on the 7Q10 flow calculation. Use of the 7Q10 was intended to facilitate estimation of the allowable pollutant concentrations, but was later adopted as a minimum flow requirement below dams. Thus, the 7Q10 minimum flow requirement does not address ramping rates, frequency, duration, timing, or magnitude of flows that are important flow components that affect the persistence of aquatic organisms. A more comprehensive flow management strategy is warranted. As we have shown in our PAL for the ACF, seasonal flow variation (e.g., magnitude, timing, duration, and frequency of low and high flows) need to be integrated into project operations so that the authorized project purpose of Fish and Wildlife is met.

3.6.3.2 Water quality

The Etowah River from the Oostanaula confluence to the Allatoona Dam is classified by the GAEPD for recreation and fishing (GAEPD 2001). Water temperature is an important ecological cue for reproduction, migration and other life history aspects of aquatic organisms. However, water temperatures below Allatoona Reservoir are lower than would naturally occur due to hypolimnetic release from

Allatoona Dam. Temperatures do not return to expected natural values until more than 25 miles downstream of the dam, which may explain why the Etowah darter does not occur in this reach (Duncan et al. 2010). Daily temperature fluctuations occur naturally, but are also affected by hydropeaking. Although the cooler temperatures found in the Etowah River support a recreational fishery for striped bass (Matt Thomas, GA DNR, pers. comm. 2010), temperature fluctuations that are induced by dam operations are likely to negatively affect both striped bass and non-game species.

Temperature and dissolved oxygen

Dissolved oxygen diffusers were installed and used in Lake Allatoona from 1968 to 1986. Since cessation of DO diffuser use, multiple studies showed that dissolved oxygen frequently falls below 2.0 mg/L (USACE 2000) below Allatoona Dam. DO measurements made by Georgia EPD in 2001 show that summer and fall months have the lowest DO concentrations and that DO concentrations are higher downstream near Cartersville, Georgia (Figure 4; EPA STORET data accessed in 2009). 100% of all DO measurements in August and September of 2009 below Allatoona Dam were below 4.0 mg/L, and were sometimes < 1.0 mg/L (Figure 5; USFWS unpublished data collected in 2009). These data unequivocally show that operation of Allatoona Dam violates Georgia state water quality standards and that dam operation does not meet the authorized purposes of Fish and Wildlife Management and Water Quality.

3.6.4 Habitat protection

This reach of river could benefit significantly from a flow regime that would allow shallow water habitats to persist long enough for important life stages of target species to develop.

Designated Critical Habitat: There are no areas designated as critical habitat on the Etowah River.

3.6.5 Aquatic Organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Loss of connectivity between headwaters and lower reaches remains a serious concern for the ecological integrity of the system.

3.6.6 River Reach Research Needs

- Develop and implement and/or participate in monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Implement and/or assist in surveys to determine distribution and abundance of rare and federally protected aquatic species in the watershed.

- Determine and implement non-peaking flow windows during portions of the year critical to aquatic organisms.

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.7 Oostanaula-Coosawattee Rivers below Carters Reservoir

3.7.1 River Reach General Description

Below Carters and Carters Reregulation Dams, the Coosawattee meets with the Conasauga and forms the Oostanaula River, which in turn becomes the Coosa at its confluence with the Etowah in Rome, Georgia. The Coosawattee River system flows westward. The river and tributaries drain the Southern Blue Ridge, Southern Ridge and Valley, and Piedmont physiographic provinces. Carters Dam on the Coosawattee River creates Carters Reservoir, a 3220-acre impoundment built for flood control, navigation, hydroelectric power and recreation (USACE 1998). Flows from Carters Dam are partly reregulated by Carters Rereg Dam, located immediately downstream.

3.7.2 Species

Fish: American eel, lake sturgeon, blue shiner, lined chub, bluehead chub, river chub, quillback, highfin carpsucker, southeastern blue sucker, freckled madtom, chain pickerel, coldwater darter, amber darter, coal darter, Coosa bridled darter, freckled darter, and river darter are thought to have occurred in the Oostanaula and Coosawattee Rivers and/or their tributaries, but have apparently been extirpated in at least portions of these river basins (Freeman et al. 2005; Freeman 1998; Burkhead et al. 1997). The lake sturgeon is a species that has been recently reintroduced into the upper Coosa River Basin in Georgia. The lined chub, Coosa chub, burrhead shiner, river redhorse, rock darter, trispot darter, goldline darter, freckled darter, river darter, southern walleye, smallmouth buffalo and striped bass are of Federal/State interest that occur within this reach and/or its tributaries (Mettee et al. 1996; Boschung and Mayden 2004; Pierson 1998; Freeman et al. 2005).

Mollusks: Historically, approximately 43 freshwater mussel species were known from the Oostanaula River and its tributaries and approximately 20 freshwater mussel species were known from the Coosawattee River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Oostanaula River and its tributaries included the rayed creekshell, Alabama spike, delicate spike, southern acornshell, southern clubshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, southern pigtoe, Georgia pigtoe, fine-lined pocketbook, cylindrical lioplax, flat pebblesnail, inflated heelsplitter, and Coosa creekshell (USFWS 2000; Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Coosawattee River and its tributaries included the Alabama spike, southern clubshell, Georgia pigtoe, and triangular kidneyshell (Williams and Hughes 1997). Surveys of the mainstem Oostanaula River conducted in the late 1990's located live specimens of the Coosa fiveridge, elephantear, southern pocketbook, fragile papershell, washboard, threehorn wartyback, triangular kidneyshell, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, and paper pondshell. Shell material of the Alabama spike, southern combshell, Alabama heelsplitter, and southern clubshell was also identified (Williams and Hughes 1997). Surveys of the mainstem Coosawattee River below Carters Dam and a short reach above Carters Reservoir conducted in the late 1990's located live specimens of Alabama spike, fragile papershell, Pleurobema sp., purple heelsplitter, triangular kidneyshell, giant floater, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, and paper pondshell. Shell material of other species was located for the elephantear and southern pocketbook (Williams and Hughes 1997). The Service also located live individuals and shell material of the threehorn wartyback in the mainstem Coosawattee below Carters Dam in 2007 (Alice Lawrence, USFWS, pers. comm. 2010).

3.7.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, instream flow, and reduce the effects of ramping from upstream dams. The Corps can also help to protect reservoir fisheries, as well as restore resident and migratory aquatic species to historic abundances in remaining suitable riverine habitats.

State and federal agency representatives, private landowners, business owners, and conservation groups held a public stakeholder meeting at Red Top Mountain State Park, Georgia on August 8, 2009. The intent of this meeting was to openly discuss and develop a vision for upper ACT Basin water management, with the explicit intent to inform our collective efforts to update the WCM. Radio announcements, newspaper announcements, and fliers were distributed to advertise the meeting and harness public interest and participation. The Corps was invited to attend this meeting but no Corps representative was sent. Stakeholders at the meeting 1) agreed that water management in the upper ACT could be improved to benefit the multiple water uses and 2) developed a list of fundamental and means objectives for water management below upper ACT Corps projects (Figure 3). The Corps needs to engage this diverse group of stakeholders because this effort is broad in scope, encompasses multiple stakeholders, acknowledges multiple demands on water resources, and is intended to improve the WCM and flow management. It was generally agreed that an adaptive management approach to flow management would be beneficial, but to facilitate the Corps modeling efforts, we recommend the approach for flow modeling used in the ACF PAL utilizing the methods of Mathews and Richter (2007).

3.7.3.1 Instream flow

The Carters Lake project is a hydroelectric pump-storage peaking facility, with hydropower generation occurring several hours each weekday. When electrical demand is low, water is pumped back into Carters Lake, which avoids the downstream problems associated with a hydropeaking flow regime. The minimum flow requirement at Carters Reregulation Dam (240 cfs) was developed based on the 7Q10 flow calculation. Use of the 7Q10 was intended to facilitate estimation of the allowable pollutant concentrations, but was later adopted as a minimum flow requirement below dams. Thus, the 7Q10 minimum flow requirement does not address ramping rates, frequency, duration, timing, or magnitude of flows that are important flow components that affect the persistence of aquatic organisms. A more comprehensive flow management strategy is warranted given the biodiversity and number of imperiled species below Carters Dam and Carters Rereg Dam. Seasonal flow variation (e.g., magnitude, timing, duration, and frequency of low and high flows) needs to be integrated into project operations so that the authorized project purpose of Fish and Wildlife is met.

3.7.3.2 Water quality

The Oostanaula River carries the GAEPD's water use classification of recreation and fishing (GAEPD 2001)

Temperature and dissolved oxygen

Tailrace temperatures and dissolved oxygen levels have not been collected and analyzed regularly below Carters Rereg Dam. Although data collected in August and September 2009 below Carters Rereg Dam show that DO levels meet state water quality standards (Figure 6), we recommend continuous monitoring as part of standard operating procedures for the project, particularly during the summer and fall.

3.7.4 Habitat protection

Despite the completion of the Carters Lake project in 1975, to date no mitigation for loss of significant aquatic resources has been developed. Mitigation for wildlife (including wetland and terrestrial ecosystems) has been debated but not resolved. Approximately 4,200 terrestrial acres were inundated, 40.9 miles of streams were impounded, 0.4 miles of stream were filled, and wetland loss is unknown. Terrestrial and stream impacts should be included in the DEIS and mitigation measures should be implemented.

Priority sub-basins: The Conasauga River and Holly Creek are important tributaries for genetic flow and refugia. Flow management needs to ensure adequate connectivity with these streams.

Designated Critical Habitat: Critical habitat has been designated for the southern acornshell, ovate clubshell, southern clubshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, Coosa moccasinshell, southern pigtoe, and fine-lined pocketbook in the following river reaches: (USFWS 2004)

1. Oostanaula River mainstem from confluence with the Etowah River upstream to the confluence of the Conasauga and Coosawattee Rivers.
2. Coosawattee River from its confluence with the Conasauga River upstream to GA Hwy. 136.
3. Conasauga River mainstem from its confluence with the Coosawattee River upstream to Murray County Rd 2.
4. Holly Creek mainstem from its confluence with the Conasauga River upstream to the confluence of Rock Creek.

3.7.5 Aquatic organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Loss of connectivity between headwaters and lower reaches remains a serious concern for the ecological integrity of the system.

3.7.6 River Reach Information Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Implement surveys to determine distribution and abundance of rare, and federally protected aquatic species in the watershed.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

4.0 SUMMARY

The Corps, in the DEIS for the WCM update, at minimum should address the following issues:

1. **Low DO below reservoirs, and meeting of State water quality standards**: we recommend that DO and temperature be monitored above and below Corps dams throughout the water column during summer low-flow periods to identify problem areas and develop courses of action. We will evaluate using:
    a. Total number of days with dissolved oxygen below a daily average of 5.0 mg/L;
    b. Total number of instantaneous "measurements" less than 4.0 mg/L;
    c. Monthly exceedance figures and box plots with outliers for dissolved oxygen (mg/L);
    d. Monthly exceedance figures and box plots with outliers for water temperature; and
    e. Average stream percent wastewater.

2. **Protection and enhancement of remaining free-flowing river habitats**: we recommend identification and mapping using a GIS, with characterization of substrates, analysis of patterns of sediment deposition and scour, and development of species inventories. We will evaluate using the percent of free-flowing stream channel identified as high quality habitat and available for aquatic species reintroductions by the AABC, as well as the percent of free-flowing stream channels impacted by dredging, sedimentation, and poor water quality conditions that do not meet State standards.

3. **Aquatic organism passage at dams, particularly in the upstream direction**: we recommend continuing to facilitate research on timing, duration and efficacy of using alternative locking procedures and attraction flows to re-establish ecological connectivity of the river system. We also recommend continued research on fish passage facilities and structures, and methods to screen aquatic organisms from effects of turbines. We will evaluate success by the number of priority species and individuals shown to successfully pass through Corps L&Ds.

4. **Temperature effects on species of concern from reservoirs and hydroelectric operations**: as with DO, we recommend monitoring to determine problem areas, and development of possible alternative storage and release protocols to minimize ecological degradation. We will evaluate using the percent of free-flowing stream channel impacted by reservoir-induced changes in water temperature.

5. **Minimum flows available for Weiss bypass channel**: with APC, develop minimal flows and patterns of natural flows released from upstream Corps dams to ensure viability of federally listed mollusk populations in the Weiss Bypass channel. We will evaluate by determining frequency, timing, and duration of inadequate water levels to support mussels and other aquatic species, and the frequency, timing and duration of backflow events from peaking flows from the Weiss Reservoir.

6. **Conservation and recovery of natural flow variability, and reduction of effects of hydropower peaking flows on species of concern:** we recommend that as many environmental flow components as possible be developed and implemented below Corps dams using the methods of Mathews and Richter (2007). We recommend research that identifies critical flow periods where peaking flows should be avoided to ensure viability of important spawning and rearing life stages. We will evaluate by comparing unaltered flow pattern estimates with USGS gage data and proposed flows in the DEIS. The potential change in frequency of low-flow events below Claiborne Dam is also of interest.

7. **Maintenance of floodplain connectivity to flood pulses:** we recommend developing patterns of natural flow that approximate pre-dam inundation frequency, timing and duration in free-flowing sections of the ACT Basin. We will evaluate by comparing estimated pre-dam flow parameters with USGS gage data to estimate changes in return intervals of bankfull and higher flood events, and changes in seasonal timing and duration of flood events. Similar to the ACF PAL, we are also interested in the frequency (% of days) of growing season (April-October) floodplain connectivity (acres) to the main channel; and frequency (% of years) of growing season (April-October) floodplain connectivity (acres) to the main channel.

8. **Potential for reintroductions, enhancements of listed species populations in the basin:** we recommend that the Corps develop a cooperative relationship with the AABC to develop adaptive management protocols and coordinate reintroductions and enhancement of habitat for federally listed species. We will evaluate using the percent of river reaches that are classified by the AABC as high quality habitat suitable for aquatic reintroductions by the AABC, and that meet State water quality guidelines.

9. **Restoration and maintenance of healthy water quality parameters for all life stages of aquatic species under a variety of flow conditions:** we recommend that the Corps develop monitoring programs that identify existing and potential water quality problems related to Corps dam and hydropower operations, and use their water management authority to limit and mitigate water quality issues that develop in Corps reservoirs and tailwaters. We will evaluate using the percent of the ACT mainstem river length that meets State water quality criteria during low-flow periods.

10. **Development of adaptive management protocols that include goals, objectives, research and monitoring to allow greater understanding of riverine ecosystem response to complex variables:** we recommend the Corp consider an approach explicitly designed to develop new information that can inform ongoing dam and reservoir operations. We will evaluate by comparing pre-and post WCM update operational guidelines and practices.

There are numerous other issues of importance including potential effects of climate change, and potential future water use scenarios in the ACT Basin. However, the above issues clearly need to be addressed in order to halt ongoing environmental damage to fish and wildlife resources.

To conclude, the Service feels strongly that the Corps should begin building an adaptive management framework for operations that explicitly outlines goals and objectives of operations, continually monitors and analyzes ecosystem response, and adjusts operations accordingly based on what we have learned. We strongly recommend research and monitoring be primary components of dam operations.

Because of Corps dam operations, many river segments do not meet State water quality standards. Corps dams do not provide adequate habitat for fish and wildlife. So that Corps projects meet their authorized purposes of water quality and fish and wildlife, we strongly recommend that the Corps work with the Service to comprehensively evaluate and modify the WCM.

The updating of the WCM should not commit the Corps to additional long-term continual degradation of this river system, recognized worldwide for its incredible biotic wealth. Instead, the Corps now has an opportunity and an obligation to use their authority and resources to protect and enhance the ecological integrity of the ACT Basin. If you have any questions about this PAL, in Alabama please contact Dan Everson at (251) 441-5837 or in Georgia, contact Will Duncan or Alice Lawrence at (706) 613-9493.

Sincerely,

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

cc: J. Ziewitz, USFWS, Tallahassee, FL
W. Duncan, USFWS, Athens, GA
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LITERATURE CITED

ADCNR (Alabama Department of Conservation and Natural Resources). 2000. Letter to Mr. Barry K. Lovett and Mr. Mike Akridge, Alabama Power Company, July 18, 2000 and December 5, 2000.

ACWCS (Alabama's Comprehensive Wildlife Conservation Strategy). 2005. Alabama's Draft Comprehensive Wildlife Conservation Strategy. Accessed October 6, 2005 , 229 p.

ADEM (Alabama Department of Environmental Management). 1984. Effect of hydroelectric dams on water quality in Alabama. Montgomery, AL.

----- 2000. Rules and Regulations, Water Quality Program, Division 6 Volume 1. Montgomery, AL.

----- 2002. Alabama's final 2002 section 303(d) list. Accessed at http://www.adem.state.al.us/WaterDivision/WQuality/303d/WQ303d.htm, October 24, 2005.

----- 2004. Alabama's 2004 integrated water quality monitoring and assessment report.

AL CWP (Alabama River Clean Water Partnership). 2005. Draft Alabama River Basin Management Plan. February 4, 2005.

APC (Alabama Power Company). 2005. Application to the Alabama Department of Environmental Management for water quality certification for the Weiss, Neely Henry, Logan Martin, Lay, Mitchell, Jordan and Bouldin hydroelectric developments. 9,933 pp.

----- 1995b. Project 2146; Weiss Dam-Public Safety Plan.

APC/KA (Alabama Power Company/Kleinschmidt Associates). 2000a. Coosa and Warrior River relicensing: Jordan Project and Bouldin Development, Initial Information Package. 415 p.

----- 2000b. Coosa and Warrior River relicensing: Weiss Development, Initial Information Package. 281 p.

Atkins, J.B., H. Zappia, J.L. Robinson, A.K. McPherson, Moreland, R.S. Harned D.A., B.F. Johnston, and J.S. Harvill. 2004. Water quality in the Mobile River Basin, Alabama, Georgia, Mississippi, and Tennessee, 1999-2001: U.S. Geological Survey, Circular 1231, 40 p.

Bogan, A.E., J.M. Pierson, and P. Hartfield. 1995. Decline in the freshwater gastropod fauna in the Mobile Bay Basin. Pages 249-252 *in* E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, M.J. Mac, editors. Our Living Resources, A report to the Nation on the distribution, abundance and health of U.S. plants, animals and ecosystems. U.S. Department of the Interior, National Biological Survey, Washington, DC.

Bogan, A.E., and J.M. Pierson. 1993a. Survey of the aquatic gastropods of the Coosa River Basin, Alabama: 1992. Final report to the Alabama Natural Heritage Program, Unpubl, 72 pp.

------- 1993b. Survey of the aquatic gastropods of the Cahaba River Basin, Alabama: 1992. Final report to the Alabama Natural Heritage Program, Unpubl, 76 pp.

Boschung H.T., and R.L. Mayden. 2004. *The Fishes of Alabama.* Smithsonian Books, Washington, D.C. 736 pp.

Braun, D.P. 2004. Freshwater biohydrology of the Mobile Bay/Delta conservation area: a needs assessment. Unpublished report prepared for the Alabama Chapter of the Nature Conservancy. 49 pp.

Brooks, A. 1994. River channel change. Pages 55-75 *in* P. Calow and G.E. Petts, editors. The Rivers Handbook, Hydrological and Ecological Principals. Vol 2. Blackwell Scientific Publications, Boston.

Burkhead, N.M., S.J. Walsh, B.J. Freeman, and J.D. Williams. 1997. Status and restoration of the Etowah River, an Imperiled Southern Appalachian Ecosystem. Pages 375-444 in G.W. Benz and D.E. Collins, editors, Aquatic Fauna in Peril, The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute. Lenz Design and Communications, Decatur, GA.

Christman, S.P., F.G. Thompson, and E.L. Raiser. 1995. *Tulotoma magnifica* (Conrad) (Gastropoda: Vivpariade) status and biology in the Coosa River below Jordan Dam, Alabama. Department of Natural Sciences, Florida Museum of Natural History, Gainesville, FL.

Duncan, W. W., A. Lawrence, E. Prowell. 2010. Effects of Allatoona Dam on Etowah River Temperatures in June 2009: Modeled Effects and Actual Measurements. Unpublished U.S. Fish and Wildlife Service Report, Athens, GA. 12 pp.

Dunne, T., and Leopold, L.B., 1978. Water in Environmental Planning. W.H. Freeman Co. San Francisco, CA.

Freeman, B.J., B.A. Porter, S. Ritchea, C. Straight, and B. Dakin. 2006. Genetic population structure of the federally endangered Etowah darter, Etheostoma etowahae, and subsequent range modification. A report submitted to the Georgia Department of Natural Resources. 22pp.

Freeman, B.J. 1998. Survey of threatened and endangered fishes in the Oostanaula, Coosawattee and Etowah Rivers. University of Georgia. 33pp.

Freeman, M .C., Z.H. Bowen, K.D. Bovee and E.R. Irwin. 2001. Flow and effects on juvenile fish abundance in natural and altered flow regimes. Ecological Applications 11:179-190. 2001.

GAEPD (Georgia Environmental Protection Division). 1998. Coosa River Basin Management Plan. Atlanta, GA.

----- 2001. Rules and Regulations for Water Quality Control, Chapter 391-3-6. Atlanta, GA. 114 p.

Hartfield, P., P. Johnson, S. Ahlstedt, M. Buntin, R. Butler, J. Garner, M. Gangloff, J. Powell, and S. McGregor. 2010. A Plan for the Population Restoration and Conservation of Freshwater Mollusks of the Mobile River Basin. Report by the Mobile River Basin Mollusk Restoration Committee. 103 pp.

-------- 1993. Headcuts and their effects on freshwater mussels. Pages 131-141 *in* K.S. Cummings, A.C. Buchanan, and L.M. Koch, editors. Proceedings of a UMRCC symposium. Conservation and Management of Freshwater Mussels.

Hartfield, P. and J. Garner. 1998. Report on dive surveys of the lower Alabama River. Unpublished report., 17p.

Herod, Jeffrey J., H. N. Blalock-Herod, D.S. Ruessler, and J.D. Williams. 2001. Examination of the freshwater mussel (Bivalvia:Unionidae) community, including the federally endangered southern clubshell, Pleurobema decisum, within the Old Channel of the Coosa River, between Weiss Spillway Dam and Weiss Hydropower Dam, Cherokee County, Alabama. Unpubl report to the Alabama Power Company, 54 p.

Jackson, H.H. 1995. *Rivers of History: Life on the Coosa, Tallapoosa, Cahaba, and Alabama.* University of Alabama Press, Tuscaloosa and London. 300 pp.

Johnson, P.D. 2002. Survey and site evaluation regarding the mollusk restoration potential of the Coosa River from Jordan Dam to Wetumpka, Elmore County, Alabama; and the artificial augmentation of the fine-lined pocketbook, *Lampsilis altilis*, in the old Coosa River channel at Centre, Alabama. Unpublished Report.

Junk, W.J., P.B. Bayley, and R.E. Sparks. 1989. The flood-pulse concept in river-floodplain systems, p. 110-127. *In* D.P. Dodge [ed.] Proceedings of the International Large River Symposium. Can. Spec. Publ. Fish. Aquat. Sci. 106.

Layzer, J.B. and D. Crigger. 2001. The relationship between stream discharge and mussel recruitment. Final Report for Research Work Order 30. United States Geological Survey , Biological Resources Division. June 2001.

Mathews, R., and B.D. Richter. 2007. Application of the indicators of hydrologic alteration software in environmental flow setting. Journal of the American Water Resources Association 43: 1400-1413.

Mettee, M. F., P. E. O'Neil, T. E. Shepard, and S. W. McGregor. 2005. A study of fish movements and fish passage at Claiborne and Millers Ferry Locks and Dams on the Alabama River, Alabama. Open-File Report 0507. 29 pp.

Mettee, M.F., and T.E. Shepard. 2001. Status Survey of the Southeastern Blue Sucker (*Cycleptus meridionalis*) in the Alabama River, 1995-2000. Report to the ADCNR, Tuscaloosa, AL 36 pp.

Mettee, M.F., P.E. O'Neil, and J.M. Pierson. 1996. *Fishes of Alabama and the Mobile Basin.* Oxmoor House, Birmingham, AL. 820 pp.

Mirarchi. R.E., ed. 2004. *Alabama Wildlife, volume 1, A checklist of vertebrates and selected invertebrates aquatic mollusks, fishes, amphibians, reptiles, birds, and mammals.* The University of Alabama Press, Tuscaloosa.

Mirarchi. R.E., J.T. Garner, T.M. Haggerty, M.F. Mettee, and P.E. O'Neil, eds. 2004. *Alabama Wildlife, volume 2, imperiled aquatic mollusks and fishes.* The University of Alabama Press, Tuscaloosa.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg, 1997. The Natural Flow Regime. BioScience 47:769-784.

Postel, S. and B. Richter. 2003. Rivers for Life: Managing Water for People and Nature. Island Press. 253 pp.

Richter, B.D., J.V. Baumgartner, D.P. Braun, and J. Powell. 1998. A spatial assessment of hydrologic alteration within a river network. Regulated Rivers 14:329-340.

Sparks, R.E., J.C. Nelson, Y. Yin. 1998. Naturalization of the flood regime in regulated rivers. BioScience 48(9):706-720.

USACE (U.S Army Corps of Engineers). 1990. Interim Report: Tombigbee River Basin joint study, Alabama and Mississippi, Mobile, Alabama. pp. 158, 160-162.

—1998. Draft EIS, Water Allocation for the Alabama-Coosa-Tallapoosa (ACT) River Basin. Mobile District.

USFWS (U.S. Fish and Wildlife Service). 2000. Mobile River basin aquatic ecosystem recovery plan. Atlanta, GA. 128 pp.

----- 2004. Endangered and threatened wildlife and plants; designation of critical habitat for three threatened mussels and eight endangered mussels in the Mobile River Basin; final rule. *Federal Register,* Vol. 69, No. 126: 40084-40171.

------ 2005a. Technical/agency draft recovery plan for six Mobile River Basin aquatic snails. U.S. Fish and Wildlife Service, Jackson, MS.

------ 2005b. Technical/Agency Draft Recovery Plan for the Alabama sturgeon (*Scaphirynchus suttkusi*). U.S. Fish and Wildlife Service, Daphne, AL.

------2006. Aquatic Resource Management Plan for the Alabama River Basin. U.S. Fish and Wildlife Service, Daphne, AL. 124 pp.

------2009. Designation of Critical Habitat for Alabama sturgeon (Scaphirrynchus suttkusi). Federal Register, Vol. 74, No. 104:26487-26510.

USFWS/EPA (Environmental Protection Agency). 1999. Instream Flow Guidelines for the ACT and ACF Basins Interstate Water Allocation Formula. Atlanta, GA. 14 pp.

Watters, G.T. 2000. Freshwater mussels and water quality: A review of the effects of hydrologic and instream habitat alterations. Proceedings of the First Freshwater Mollusk Conservation Society Symposium, 1999, Ohio Biological Survey.

Williams, J.D. and M.H. Hughes. 1997. Freshwater mussels (Unionidae) of selected reaches of the main channel of rivers in the Coosa drainage in Georgia. 21pp.

Figure 1. USGS gage data at Claiborne L&D during a low flow period showing daily pattern of high and low flows related to hydropower discharges from Millers Ferry and other dams upstream.

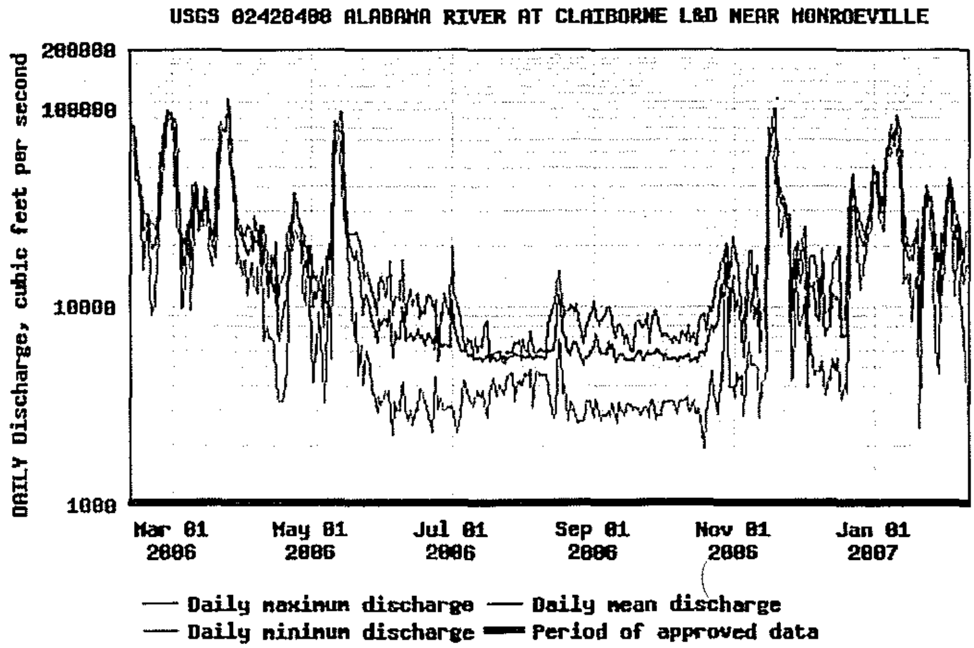


Figure 2. Continuous dissolved oxygen (DO) data collected in the Jordan Dam Tailrace, 1995-2000. Data extracted from APC's 401 Water Quality Application to ADEM, December 2005 (APC, 2005).

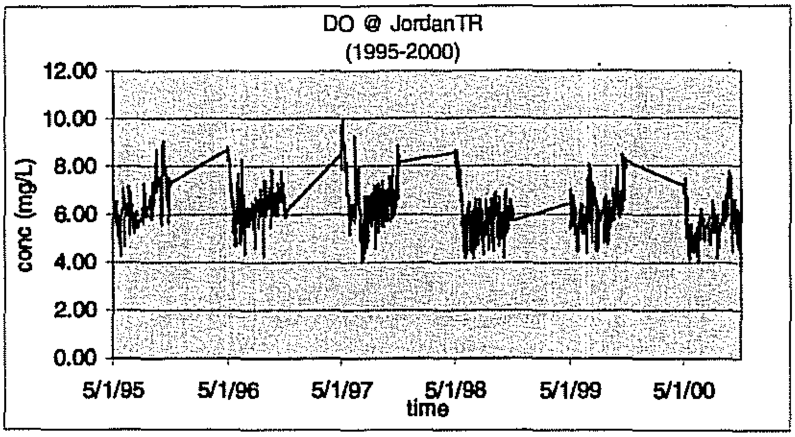


Figure 3. Fundamental (F) and Means (M) objectives developed by consensus at the stakeholders meeting on August 8, 2009 at Red Top Mountain State Park, Georgia.

F. Maximize potential for imperiled species
F. Maximize native aquatic biodiversity
F. Preservation of cool-water sport fishery (stripers, sturgeon)
M. No significant increase in summer water temperatures (late June – early Oct) above current conditions
F. Adequate flows for assimilation of waste and for municipal and industrial purposes
F. Optimizing economic value of the lakes
M. Maintaining lake levels for home owners (Allatoona only) and recreation (boat ramps), water supply
F. Maintaining reservoir and downstream water quality
M. Maintain appropriate supply and transport of bed sediment for instream habitat purposes
M. Mimic natural rates of bank erosion
M. Maintaining lake levels for reservoir and downstream water quality
M. Maintain adequate flows (e.g. magnitude, variability, timing, non-peaking window) for aquatic fauna downstream
M. Dissolved oxygen and temperature levels suitable for aquatic biota
F. Flood control
F. Hydropower generation
M. Meeting projected energy needs
F. Navigation in the lower Mobile Basin
F. Downstream recreational activities (paddling, fishing)
F. Preservation of cultural resources
F. Preservation of agricultural uses
F. Minimize impacts on fundamental objectives downstream

Figure 4. Dissolved oxygen concentrations in the Etowah River at one location upstream from Allatoona Reservoir (SR 53 near Dawsonville), and three locations below Allatoona Dam. Data obtained from EPA's STORET database. Primary data source is GA EPD.

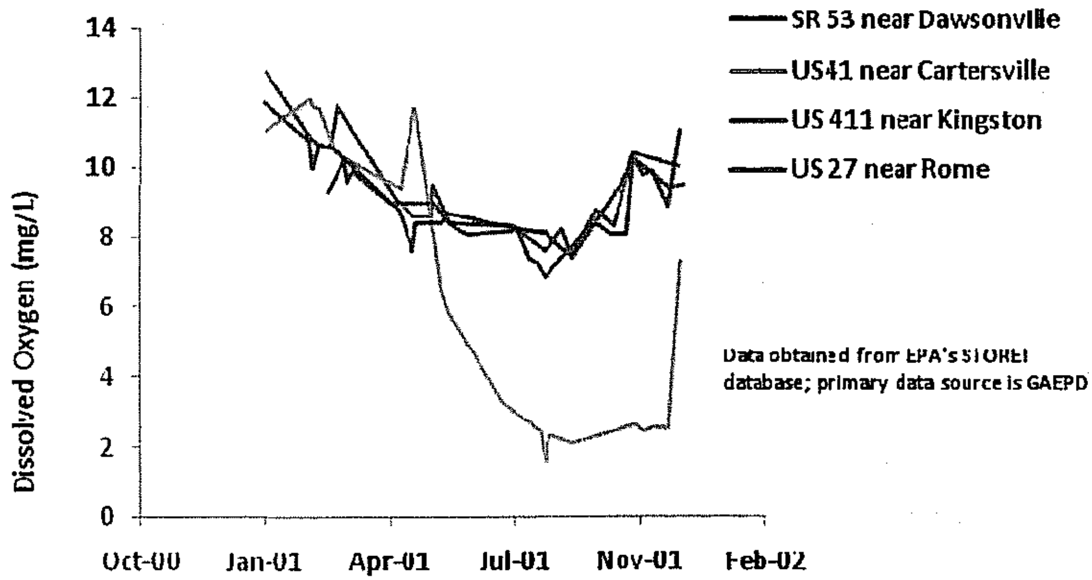


Figure 5. Temperature and dissolved oxygen data collected by the USFWS in the Etowah River approximately 400 meters below Allatoona Dam in August and September 2009.

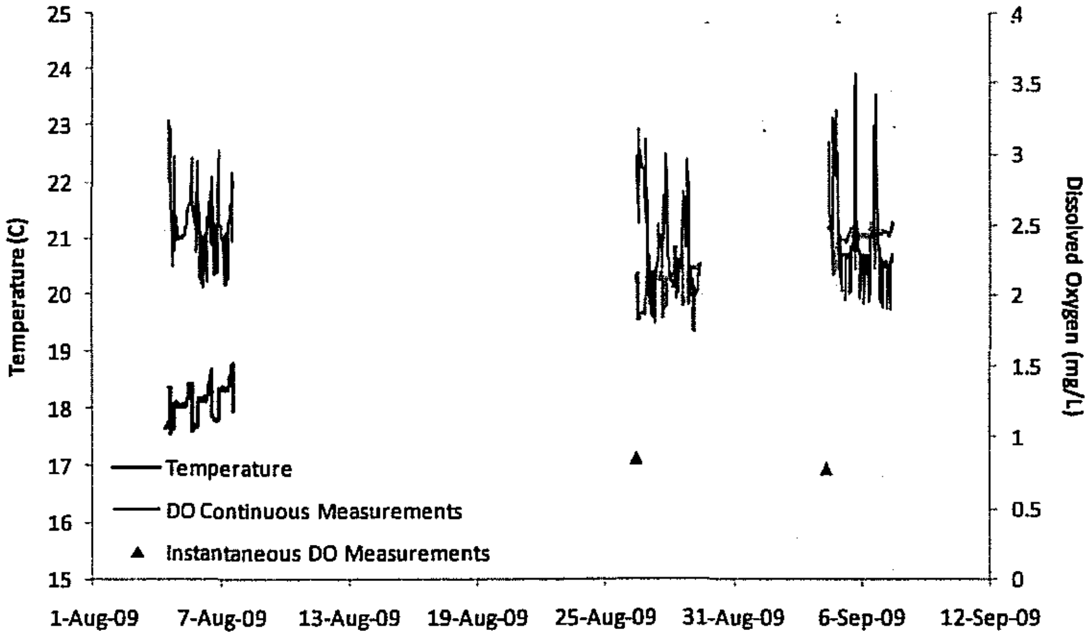
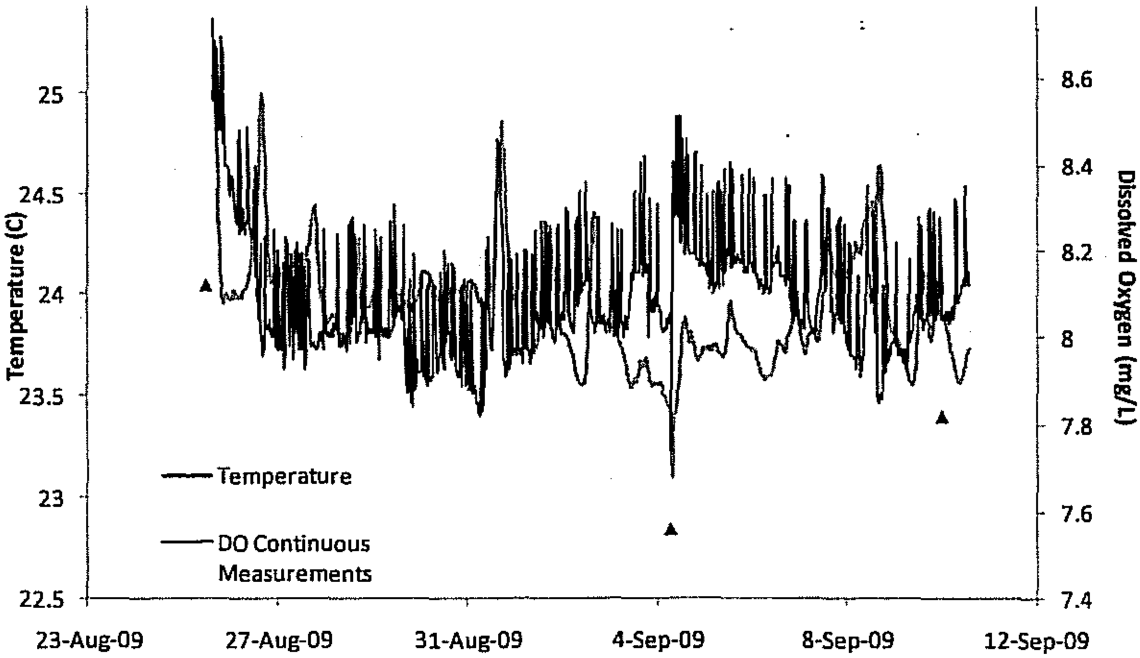


Figure 6. Temperature and dissolved oxygen data collected by the USFWS in the Coosawattee River approximately 400 meters downstream from Carter's Rereg Dam in August and September 2009.



DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, AL 36628-0001

REPLY TO
ATTENTION OF

June 6, 2011

Inland Environment Team
Planning and Environmental Division

Mr. William Pearson
Field Supervisor
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, Alabama 36526

Dear Mr. Pearson:

The enclosed document is in response to your May 3, 2010, Planning Aid Letter (PAL) and e-mailed supplement dated August 13, 2010 for the proposed Water Control Manual (WCM) Updates for the Alabama-Coosa-Tallapoosa River Basin in Georgia and Alabama. In the PAL, you identified the types of data and analyses the U.S. Fish and Wildlife Service (FWS) would need to evaluate the WCM alternatives pursuant to the Fish and Wildlife Coordination Act (FWCA - 48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*). This letter transmits the results of those analyses and/or our response. In addition, we are describing the proposed action and alternatives that are currently proposed to be carried forward for final evaluation in our Environmental Impact Statement (EIS).

Thank you for your assistance thus far in our effort to update these manuals. Based on our review of your letter and this response, we request that you provide us with your Draft FWCA Report at your earliest convenience. We are ready to assist with additional information or analyses. Should you have any questions, comments, or recommendations, please contact Mr. Chuck Sumner, (251) 694-3857, or email: lewis.c.sumner@sam.usace.army.mil.

Sincerely,

T. D. Robinson for

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosure

ACT Water Control Manual Update

Response to USFWS Planning Aid Letter dated May 3, 2010

U.S. Army Corps of Engineers, Mobile District

June 3, 2011

Contents

1 Description of the Proposed Action and Alternatives

The Corps proposes to prepare an updated master Water Control Manual (WCM or Master Manual) for the Alabama, Coosa, and Tallapoosa Rivers (ACT) Basin. The component parts of the master WCM would be nine project-level WCMs, presented as appendices. Only two of the four Alabama Power Company (APC) projects in the basin with Corps WCMs will be included in this WCM update. Additional studies would be required for Logan Martin Lake and Weiss Lake to address flood damage reduction prior to updating the manuals at those facilities. The Corps and APC will develop and execute separate Memoranda of Understanding that address only navigation and drought operations for Logan Martin and Weiss Lakes. Operations at those projects will be incorporated in the Master Manual Update.

WCMs contain drought plans and action zones to assist the Corps in knowing when to reduce or increase reservoir releases and conserve storage in the Corps reservoirs. The individual manuals typically outline the regulation schedules for each project, including operating criteria, guidelines, and guide curves, and specifications for storage and releases from the reservoirs. The WCMs also outline the coordination protocol and data collection, management, and dissemination associated with routine and specific water management activities (such as flood-control operations or drought contingency operations). Operational flexibility and discretion are necessary to balance the water management needs for the numerous (and often competing) authorized project purposes at each individual project. In addition, there is a need to balance basin-wide water resource needs. Project operations also must be able to adapt to seasonal and yearly variations in flow and climatic conditions.

The following sections present the No Action Alternative and the Proposed Action Alternative.

1.1 No Action Alternative

The Council on Environmental Quality (CEQ) regulations require analysis of the *No Action Alternative* 40 CFR.1502.14. Inclusion of the No Action Alternative in this Environmental Impact Statement (EIS) complies with CEQ regulations and serves as a benchmark against which federal actions can be evaluated. On the basis of the nature of the proposed action, the No Action Alternative represents no change from the current management direction or level of management intensity. This alternative would represent continuation of the current water control operations at each of the federal projects in the ACT Basin. The Corps' operations have changed incrementally since completion of the 1951 ACT Master Manual. Except in very general terms, it is not possible to describe a single set of reservoir operations that apply to the entire period since completion of the 1951 ACT Master Manual.

Current operations under the No Action Alternative include the following.

- Operations consistent with the Master Manual of 1951 and project-specific WCMs. For the Corps, those manuals and their dates are Lake Allatoona (1993), Carters Lake and Carters Reregulation Dam (1975), Robert F. Henry Lock and Dam (1999), Millers Ferry Lock and Dam (1990), and Claiborne Lake (1993). For APC projects, the applicable manuals and their dates are Weiss Lake (1965), H. Neely Henry Lake, (1979), Logan Martin Lake (1968), and R.L. Harris Lake (2003).
- The Corps recognizes that APC operates 11 dams (10 reservoirs) under six FERC licenses, each one having specific operational requirements: (1) the Coosa River Project (FERC Project No. 2146), which includes the Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, Lay Lake, and Bouldin Dam developments; (2) the Mitchell Lake Project (FERC Project No. 82); (3) the Jordan Dam and Lake Project (FERC Project No. 618); (4) Lake Martin Project (FERC Project No. 349)

(5) Yates Lake-Thurlow Lake (FERC Project No. 2407); and (6) R.L. Harris Lake Project, referred to as Crooked Creek Hydroelectric Project (FERC Project No. 2628). The FERC license for the Coosa River Project was issued in 1957. The FERC license for the Mitchell Lake Project was issued in 1975, and the FERC license for the Jordan Dam and Lake Project was issued in 1980. The licenses for those three projects expired on August 31, 2007. On July 28, 2005, APC applied for one new operating license that would combine all those projects as Project No. 2146. The FERC licenses could be amended in light of APC's request to modify winter pool levels at the Weiss Lake and Logan Martin Lake projects; however, the No Action Alternative does not include such modifications.

- The H. Neely Henry Lake, which operates under a revised guide curve (per a temporary variance initially granted by FERC in 2001 and effective pending relicensing of Project No. 2146), would return to operation under its original guide curve under the current FERC license.
- Specified flow requirements apply to several projects. Lake Allatoona and Carters Lake must provide for a minimum flow of 240 cubic feet per second (cfs). The Corps has a flow target of 6,600 cfs from Claiborne Lake where the actual ability to meet the target depends on releases provided by APC and intervening flows from the Cahaba River and other tributaries. In accordance with a 1972 Letter Agreement between the Corps and APC, APC ensures a combined 4,640-cfs release calculated at Montgomery, Alabama, on the basis of APC releases from JBT, for navigation during normal conditions.
- The Corps provides 6,371 acre-feet (ac-ft) of storage in Lake Allatoona for water supply for the City of Cartersville, Georgia and 13,140 ac-ft for the CCMWA. Total storage allocated to water supply is 19,511 ac-ft.
- The Corps provides 818 ac-ft in Carters Lake for water supply for Chatsworth, Georgia.
- The Corps would continue to manage fish spawning operations at Lake Allatoona, as outlined in District Regulation (DR) 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft Standing Operating Procedure (SOP) *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005). During the largemouth bass spawning period, from March 15 to May 15, the Corps seeks to maintain generally stable or rising reservoir levels at Lake Allatoona. Generally stable or rising levels are defined as not lowering the reservoir levels by more than 6 inches, with the base elevation generally adjusted upward as levels rise from increased inflows or refilling of the reservoir.

The following subsections describe key operational elements that apply to evaluating the No Action Alternative.

1.1.1 General System Operations

The Corps operates its reservoirs in the ACT Basin to provide for the authorized purposes of flood damage reduction, navigation, hydropower, recreation, water supply, water quality, and fish/wildlife. The Corps considers each of those authorized project purposes when making operational decisions, and those decisions affect how water is stored and released from the projects. In general, to provide the authorized project purposes, flow must be stored during wetter times of each year and released from storage during drier periods of each year. Traditionally, that means that water is stored in the lakes during the spring and released for authorized project purposes in the summer and fall months. In contrast, some authorized project purposes such as lakeside recreation, water supply, and lake fish spawning are achieved by retaining water in the lakes, either throughout the year or during specified periods of each year. The flood damage reduction purposes at certain reservoirs requires drawing down reservoirs in the fall through winter months to store possible flood waters and refilling pools in the spring months to be used for multiple project purposes throughout the remainder of the year.

Certain APC projects (Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, and R.L. Harris Lake) are also required to operate for flood damage reduction and navigation. MOUs for each of those APC projects concerning the operation of non-Corps projects have been adopted by the APC and the Corps. WCMs developed for the APC projects are used to guide operations for flood damage reduction and navigation. The MOUs clarify the operational responsibilities of the APC and Corps. Copies of the project MOUs are included in the current WCMs.

The conflicting water demands require that the system be operated in a balanced manner to meet all authorized purposes, while continuously monitoring the total system water availability to ensure that minimum project purposes can be achieved during critical drought periods. The balanced water management strategy for the Corps reservoirs in the ACT Basin does not prioritize any project purpose but seeks to balance all project authorized purposes. The intent is to maintain a balanced use of conservation storage among all the reservoirs in the system, rather than to maintain the pools at or above certain predetermined elevations.

The last major evaluations of the environmental consequences of the individual Corps reservoirs in the ACT Basin were included in project operations EISs completed in the 1970s. Since then, incremental changes in project operations have occurred because of changes in hydropower contracts and operating schedules, changes in navigation flow requirements, and other changes related to water quality, environment, or other uses of the system. Historical records maintained by the Corps illustrate the observed impacts of changes in operations or seasonal variations over time on pool levels and flow releases from Corps reservoirs. Comparing historic operations conditions with existing operations conditions provides a complete picture of the impacts related to changes in water demand and water resources management in the basin as well as a perspective on existing flows to plan for future changes.

1.1.2 Guide Curves and Action Zones

Guide curves define the target amount of water to be held in a reservoir at specified times of the year. Under the No Action Alternative, guide curves would remain as currently defined. Action zones are used to manage the lakes at the highest level possible for recreation and other purposes, meet minimum hydropower needs at each project, and determine the amount of storage available for downstream purposes such as flood damage reduction, hydropower, navigation, water supply, water quality, and recreation. In accordance with Engineer Regulation (ER) 1110-2- 241 *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects,* the Corps is responsible for the review and approval of the flood damage reduction plans and Reservoir Regulation Manuals for the APC storage projects Weiss, H. Neely Henry, and Logan Martin Lakes on the Coosa River and R.L. Harris Lake on the Tallapoosa River. The purpose of the reservoir manuals is to define a plan of operation at the reservoirs during the occurrence or threatened occurrence of damaging flood conditions at downstream stations, when such conditions can be alleviated or partially alleviated by the operation of the dam and power plant in the interest of flood damage reduction. In addition, in the 1960s the Corps and APC developed MOUs to clarify the responsibilities of the two entities with regard to operation of the projects for flood damage reduction and other purposes and to provide for the orderly exchange of hydrologic data.

Guide curves have been defined for two of the Corps projects (Carters Lake and Lake Allatoona; and the four APC projects (Weiss, H. Neely Henry, Logan Martin, and R.L. Harris Lakes); no guide curves exist for Claiborne Lake, William “Bill” Dannelly Lake (Millers Ferry Lock and Dam), or R.E. “Bob” Woodruff Lake (Robert F. Henry Lock and Dam). Additionally, action zones have been defined at Lake Allatoona. The zones are used to manage the lake at the highest level possible while balancing the needs of all the authorized purposes. Action Zone 1 is the highest in each lake and defines a reservoir condition where all authorized project purposes should be met. The lake level at the top of Zone 1 is the normal pool level or top of conservation pool (or the guide curve). As lake levels decline, Zone 2 defines increasingly critical system water shortages, and prescribes reductions in reservoir releases as pool levels drop as a result of drier than normal or drought conditions. The action zones also provide guidance on meeting minimum hydropower needs at each project as well as determining 1 the minimum releases for downstream purposes such as water supply and water quality. Under the No Action Alternative, the current guide curve and action zones (at Lake Allatoona) would continue to serve as the basis for Corps management of the reservoir. Figures 1.1-1 through 1.1-6 show the annual guide curves and action zones for pertinent Corps and APC projects. Each of the figures for the APC projects (Figures 1.1-3 through 1.1-6) depict a *drought curve*. Those drought curves have been established by APC for their drought operations under their Alabama Power Company Drought Operations Plan (APCDOP). Although used by APC for general planning, their drought curves have not been adopted by the Corps as part of the No Action alternative.

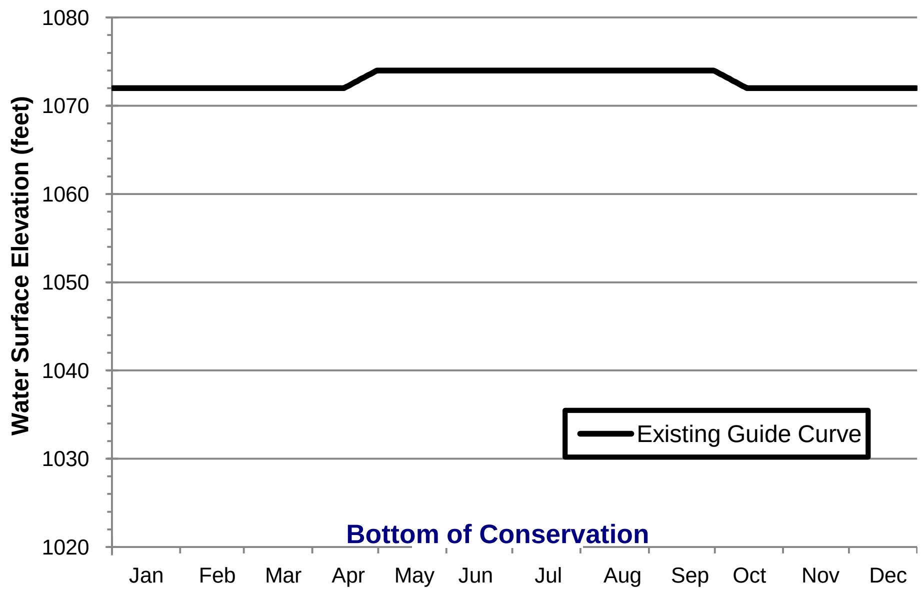


Figure 1.1-1. Carters Lake guide curve.

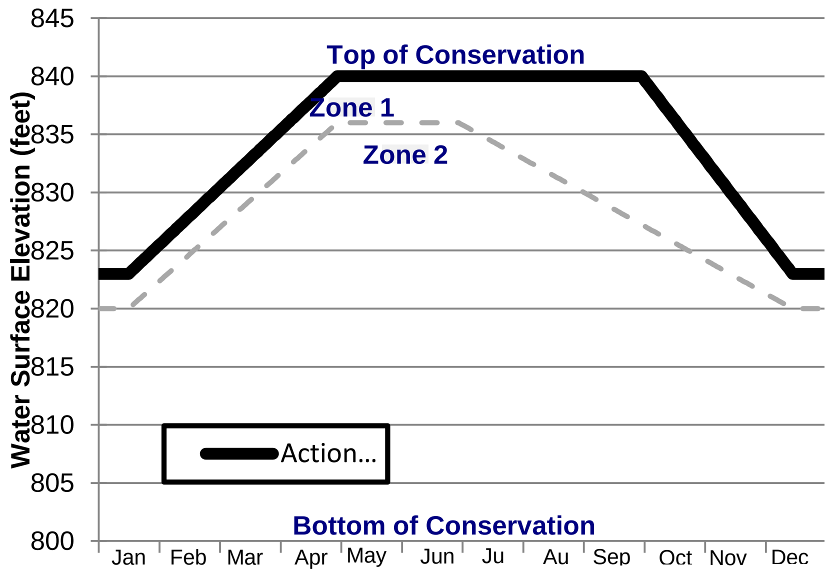


Figure 1.1-2 Lake Allatoona guide curves and action zones.

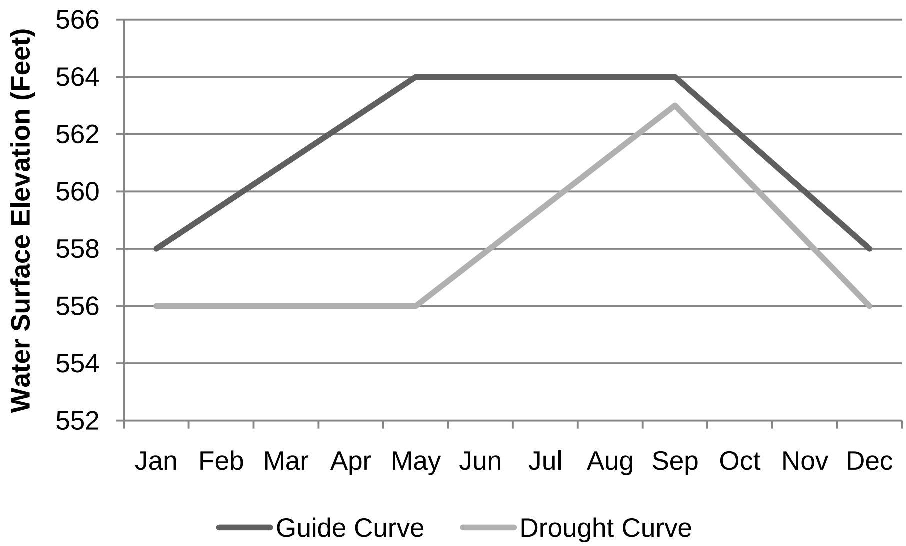


Figure 1.1-3 Weiss Lake guide curves.

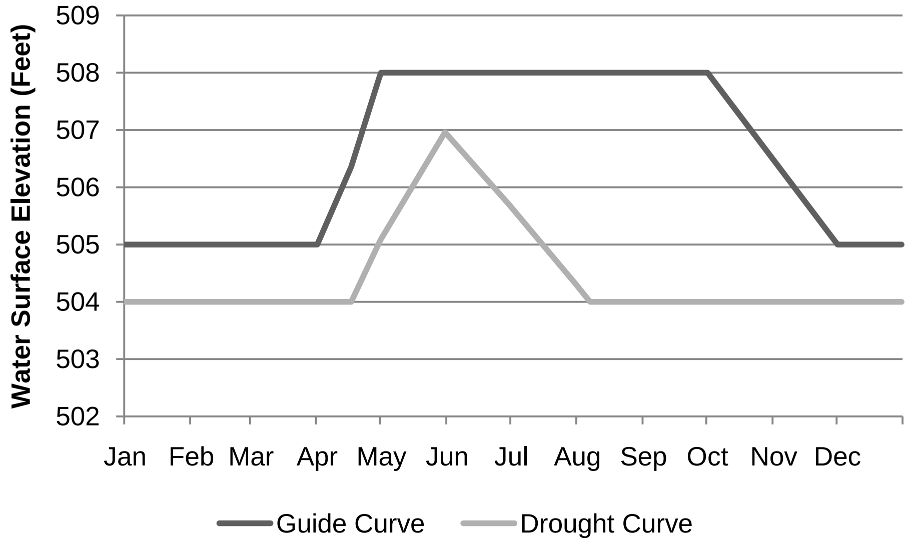


Figure 1.1-4 H. Neely Henry Lake guide curves.

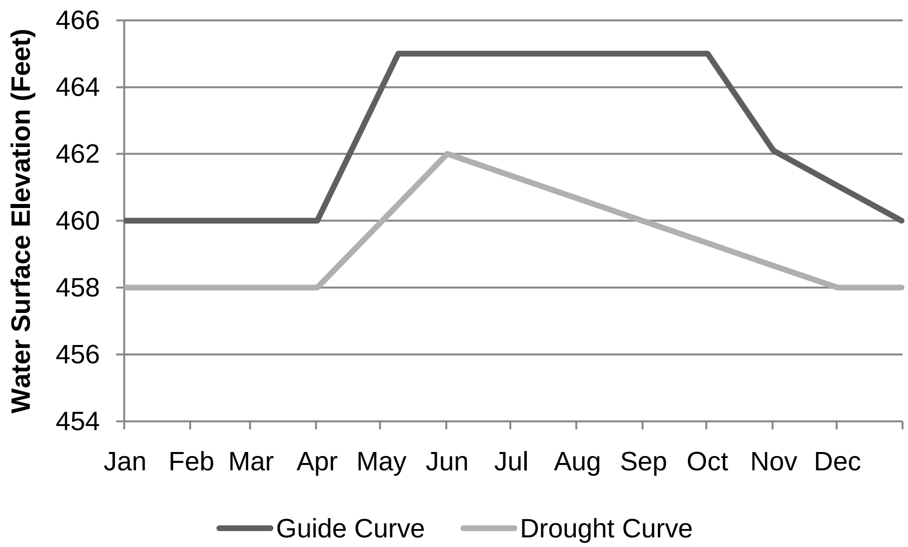


Figure 1.1-5 Logan Martin Lake guide curves.

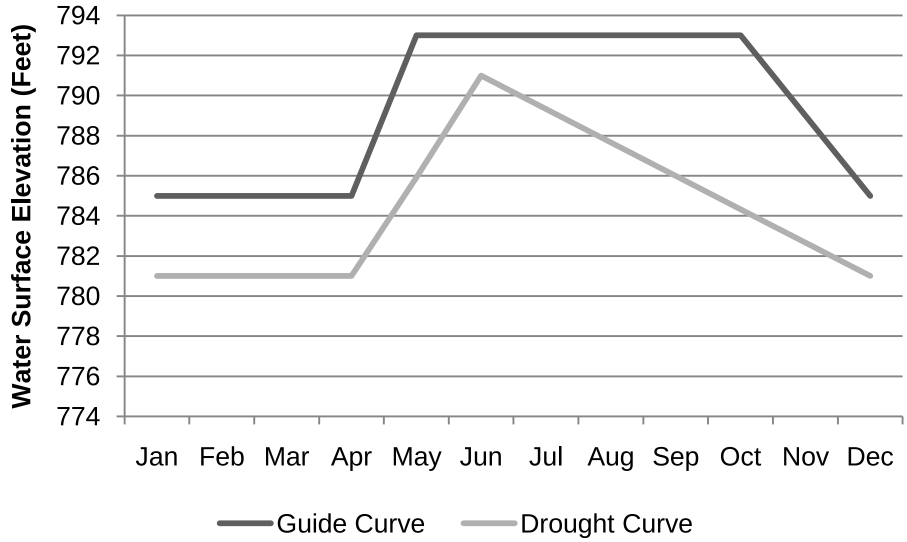


Figure 1.1-6 R.L. Harris Lake guide curves.

1.2 Proposed Action Alternative

Under the Proposed Action Alternative, the Corps would continue to operate federal projects in the ACT Basin in a balanced manner to achieve all authorized project purposes. Operations under the Proposed Action Alternative include the following.

- Implement a revised APCDOP with enhancements recommended by the USFWS. The revised APCDOP with USFWS enhancement is depicted in Table 1.2-1.
- Provide for seasonal navigation releases, coupled with seasonal maintenance dredging, to support commercial navigation in the Alabama River for a 9.0-ft or 7.5-ft channel depth as long as sufficient basin inflow above the APC projects is available. When sufficient flows cannot be provided to continue to support a minimum 7.5-ft navigation channel, navigation would be suspended and flows at Montgomery would be reduced to 4,640 cfs (7Q10) or lower if one or more of the drought operations triggers (low basin inflows, low composite conservation storage, or low state line flows) would be exceeded. APC projects on the Coosa and Tallapoosa Rivers would continue to operate under their current FERC licenses with specific operational requirements. FERC relicensing actions are underway for the Coosa River projects, and APC has requested to modify winter pool levels at the Weiss Lake and Logan Martin Lake projects. The Proposed Action Alternative does not include those proposed modifications by APC.
- The APC project, H. Neely Henry Lake (Coosa River), which operates with a revised guide curve under a FERC license variance (with Corps concurrence) would continue to operate under its revised guide curve (Figure 1.2-1).
- Specified flow requirements at Lake Allatoona would continue to provide for a 240-cfs minimum flow.
- The existing guide curve at Lake Allatoona would be revised to implement a phased fall drawdown period from early September through December (Figure 1.2-2). Refined operations at Lake Allatoona would include use of four action zones shaped to mimic the seasonal demands for hydropower (Figure 1.2.2). Modifications to the hydropower schedule would be put in place to provide greater operational flexibility to meet power demands while conserving storage. Specifically, under the Proposed Action Alternative, hydropower generation would be reduced during annual drawdown in the fall (September through October).
- The current minimum flow requirement would remain at 240 cfs from Carters Reregulation Dam. Refined operations at Carters Lake would include the use of two action zones to manage downstream releases. The top of the new Zone 2 begins at elevation 1,066 ft in January, increasing to 1,070.5 ft in May, dropping to 1,070 ft by October, and returning to elevation 1,066 ft through December (Figure 1.2-3). When Carters Lake is in Zone 1, minimum flow releases at Carters Reregulation Dam would be equal to the seasonal minimum flow. Those minimum flow releases are based on the mean monthly flow upstream of Carters Lake. If Carters Lake elevation drops into Zone 2, minimum flow releases from the Carters Reregulation Dam would be 240 cfs.
- The Corps provides 6,371 ac-ft of storage in Lake Allatoona for water supply for the City of Cartersville, Georgia and 13,140 ac-ft for the CCMWA. Total storage allocated to water supply is 19,511 ac-ft.
- The Corps provides 818 ac-ft in Carters Lake for water supply for the City of Chatsworth, Georgia.
- The Corps would continue to manage fish spawning operations at Lake Allatoona, as outlined in DR 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft SOP *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005). During the largemouth bass spawning period, from March 15 to May 15, the Corps seeks to maintain generally stable or rising reservoir levels at Lake Allatoona. Generally stable or rising levels are defined as not lowering the

reservoir levels by more than 6 inches, with the base elevation generally adjusted upward as levels rise from increased inflows or refilling of the reservoir.

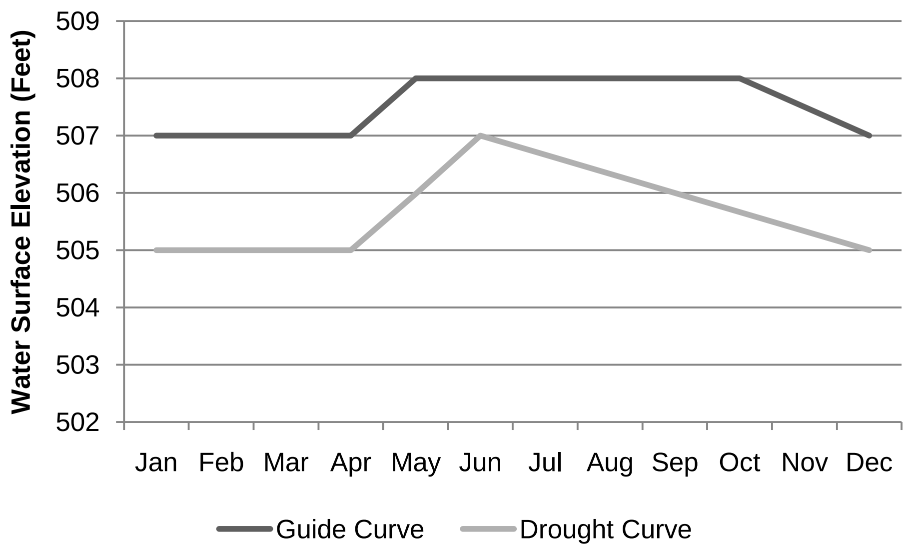


Figure 1.2-1 H. Neely Henry Lake revised guide curve.

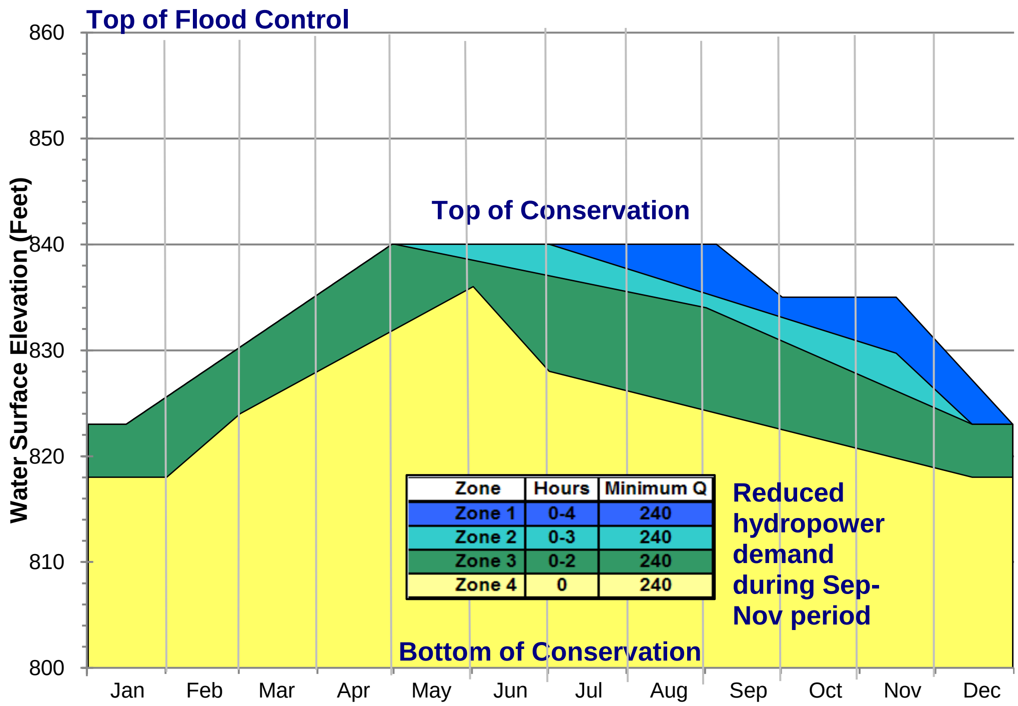


Figure 1.2-2 Operations under the Proposed Action Alternative at Lake Allatoona.

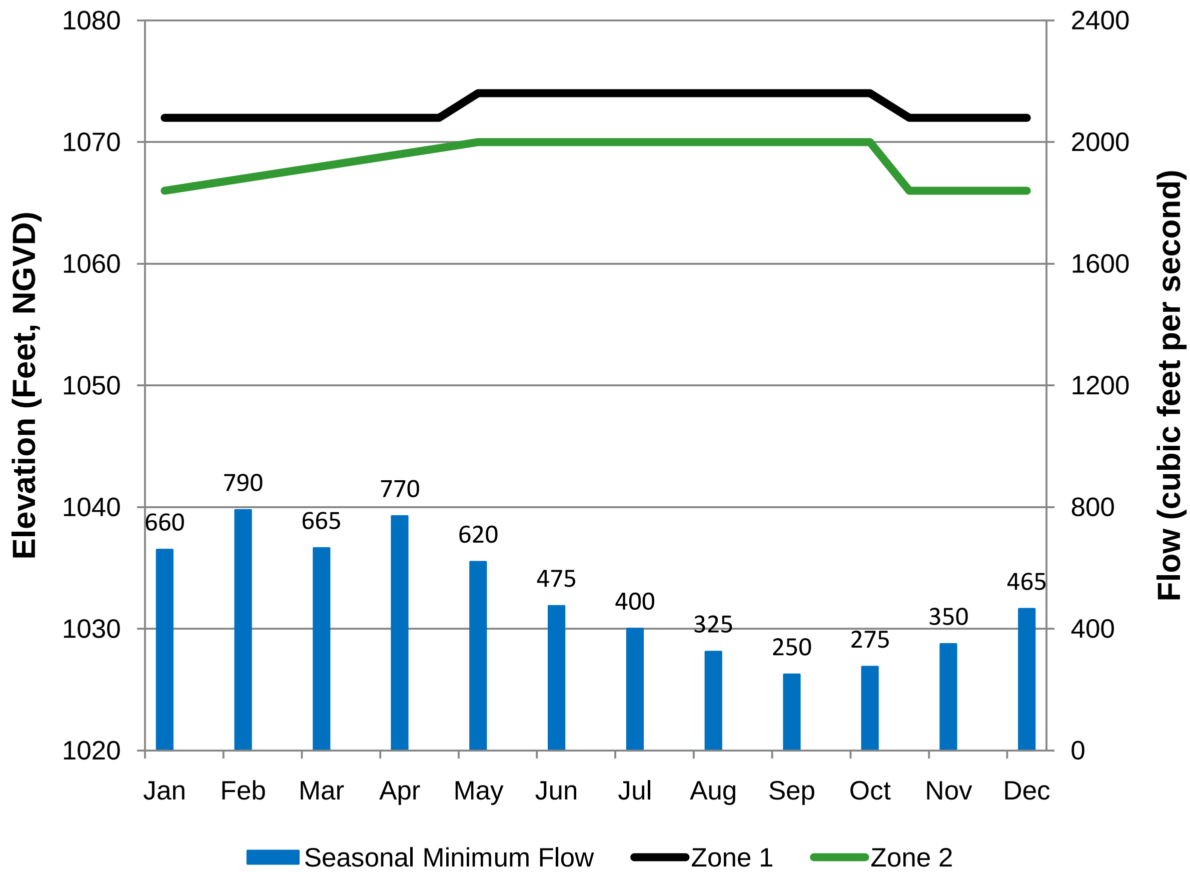


Figure 1-2.3 Carters Lake modified action zones.

1.2.1 Drought Management Plan

Both Alabama and Georgia have general statewide drought plans. Management measures to establish a drought management plan for the ACT basin were considered to meet the objectives to develop a drought management plan as required by Corps regulations and to incorporate changes made at APC projects into operations of the ACT Basin in the updated WCM. APC manages about 78 percent of the water stored in the ACT Basin.

During the drought of 2006–2008, the Corps did not have a drought plan applicable across the entire ACT Basin. The Corps generally responded to drought conditions by reducing hydropower generation at Lake Allatoona and Carters Lake as the reservoir pools dropped throughout the summer and fall. During previous droughts, the Corps coordinated frequently with APC, the states, and affected stakeholders—and the drought of 2006–2008 was no exception. During the drought, the Corps conducted biweekly water management conference calls with stakeholders from across the basin to gather information to better inform water management decision making. The Corps also supported, to a limited extent, an APC request to reduce the 4,640-cfs flow target at Montgomery by 20 percent (to 3,900 cfs).

In response to the 2006–2008 drought, APC worked closely with Alabama to develop the APC draft *Alabama Drought Operations Plan* (APCDOP) that specified operations at APC projects on the Coosa and Tallapoosa Rivers. That plan included the use composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. Similarly, in response to the 2006–2008 drought, the Corps recognized that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Lake Allatoona and Carters Lake), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable.

Building on the APCDOP and APC experience applying it to project operations, the Corps sought, in cooperation with APC, to develop a basin-wide drought plan composed of three components—headwater operations at Lake Allatoona and Carters Lake in Georgia; operations at APC projects on the Coosa and Tallapoosa Rivers; and downstream operations at Corps projects below Montgomery. The concept is graphically depicted in Figure 1.2-4 below.

1.2.1.1 Headwater Operations for Drought at Lake Allatoona and Carters Lake

Drought operations at Carters Lake and Lake Allatoona would consist of progressively reduced hydropower generation as pool levels decline. For instance, when Lake Allatoona is operating in normal conditions (Zone 1 operations), hydropower generation might be 0 to 4 hours per day. However, as the pool drops to lower action zones during drought conditions, generation could be reduced to 0 to 2 hours per day. As Carters Lake pool level might drop into a newly created Zone 2, minimum target flows would be reduced from seasonal varying values to 240 cfs.

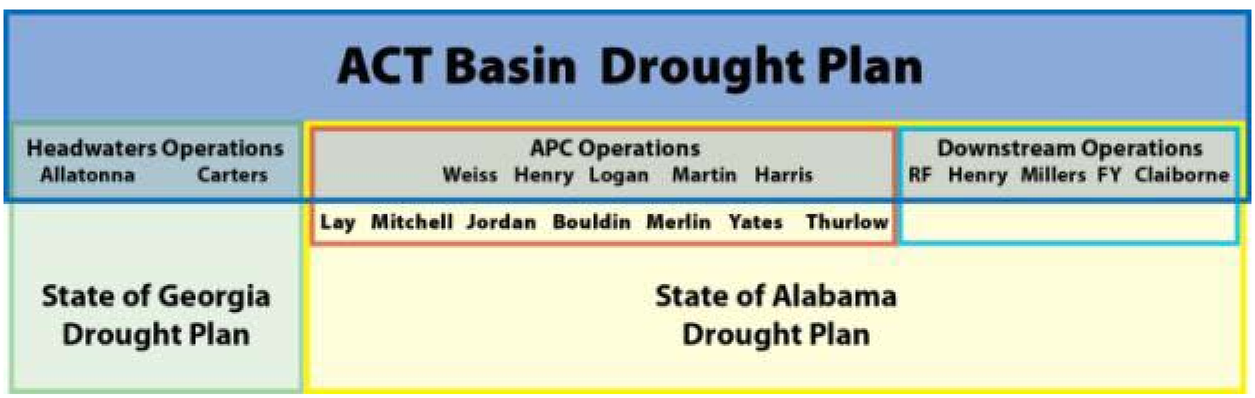


Figure 1.2-4 Schematic of the ACT Basin drought plan.

1.2.1.2 Operations at APC Projects on the Coosa, Tallapoosa, and Alabama Rivers

Under current operations, APC provides a minimum flow at Montgomery, Alabama, of 4,640 cfs (7-day average) based on the combined flows from the Tallapoosa and Coosa Rivers. The minimum flow target of 4,640 cfs was originally derived from the7Q10 flow at Claiborne Lake of 6,600 cfs. Those flows were established with the understanding that if APC provided 4,640 cfs, the Corps and intervening basin inflow would be able to provide the remaining water to meet 6,600 cfs at Claiborne Lake. As dry conditions continued in 2007, water managers understood that, if the basin inflows from rainfall were insufficient, the minimum flow target would not likely be achievable. With that understanding, the Corps considered updating drought operations in coordination with APC.

The APCDOP, described in the following paragraphs, served as the initial template for developing proposed drought operations for the ACT Basin. APCDOP operational guidelines for the Coosa, Tallapoosa, and Alabama Rivers have been defined in a matrix, on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from zero to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL=0 indicates normal operations, while a DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) are exceeded. The APCDOP matrix defines monthly minimum flow requirements for the Coosa, Tallapoosa, and Alabama Rivers as function of DIL and time of year. Such flow requirements are modeled as daily averages.

The combined occurrences of the drought triggers determine the DIL. Three intensity levels for drought operations are applicable to APC projects.

- DIL0—(normal operation) no triggers exceeded
- DIL1—(moderate drought) 1 of 3 triggers exceeded
- DIL2—(severe drought) 2 of 3 triggers exceeded
- DIL3—(exceptional drought) all 3 triggers exceeded

The indicators used in the APCDOP to determine drought intensity include the following:

1. Low basin inflow
2. Low composite conservation storage
3. Low state line flow

Each of those indicators is described in detail in Sections 1.2.2.3 through 1.2.2.5, below.

The DIL would be computed on the 1st and 15th of each month. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period. For example, as the system begins to recover from an exceptional drought with DIL=3, the DIL must be stepped incrementally back to zero to resume normal operations. In that case, even if the system triggers return to normal quickly, it will still take at least a month before normal operations can resume—conditions can improve only to DIL=2 for the next 15 days, then DIL=1 for the next 15 days, before finally returning to DIL=0.

For DIL=0, the matrix (Table 1.2-1) 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, part of the year, the required flow is the greater of one-half of the inflow into Yates Lake and twice the Heflin USGS gage. 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 when DIL=0.

For DIL=2, the Coosa River flow varies from 1,800 cfs to 2,500 cfs. On the Tallapoosa River, the minimum is 350 cfs for part of the year and one-half of Yates Lake inflow for the remainder of the year. The requirement on the Alabama River is between 3,700 cfs and 4,200 cfs.

For DIL=3, the flows on the Coosa River range from 1,600 cfs to 2,000 cfs. A constant flow of 350 cfs on the Tallapoosa River is required. It is assumed an additional 50 cfs will occur between Thurlow Lake and the City of Montgomery water supply intake. Required flows on the Alabama River range from 2,000 cfs to 4,200 cfs.

In addition to the APCDOP, the DIL affects the navigation operations. When the DIL is equal to zero, APC projects are operated to meet navigation flow target or the 7Q10 flow as defined in the navigation measure section. Once DIL is greater than zero, drought operations will occur, and navigation operations are suspended.

Table 1.2-1
APCDOP with USFWS enhancements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drought Level Response[a]	DIL 0 - Normal Operations											
	DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow											
	DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)											
	DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow											
Coosa River Flow[b]	Normal Operation: 2,000 cfs			4,000 (8,000)		4,000 – 2,000	Normal Operation: 2,000 cfs					
	Jordan 2,000 +/-cfs			4,000 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 2,000 +/-cfs		
	Jordan 1,800 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,800 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		Jordan 1,600 +/- cfs
Tallapoosa River Flow[c]	Normal Operations: 1200 cfs											
	Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)				1/2 Yates Inflow					1/2 Yates Inflow		
	Thurlow Lake 350 cfs				1/2 Yates Inflow					Thurlow Lake 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)						Thurlow Lake 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)		
Alabama River Flow[d]	Normal Operation: Navigation flow (4,640 cfs)											
	4,200 cfs (10% 7Q10 Cut) - Montgomery				Full Navigation - Montgomery (4,640 cfs)					Reduce: Full – 4,200 cfs		
	3,900 cfs (20% 7Q10 Cut) - Montgomery				4,200 cfs (10% 7Q10 Cut) – Montgomery					Reduce: 4,200 cfs-> 3,900 cfs Montgomery		
	2,000 cfs Montgomery				3,900 cfs Montgomery		4,200 cfs (10% 7Q10 Cut) - Montgomery			Reduce: 4,200 cfs -> 2,000 cfs Montgomery (ramp thru October)		
Guide Curve Elevation	Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											

a. Note these are based flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at

.

Heflin or Yates. d. Alabama River flows are 7-Day Average Flow.

1.2.1.3 Low Basin Inflow Trigger

The total basin inflow needed for navigation is the sum of the total filling volume plus 7Q10 flow (4,640 cfs). Table 1.2-2 lists the monthly low basin inflow criteria. All numbers are in cfs-days. The basin inflow value is computed daily and checked on the 1st and 15th of the month. If computed basin inflow is less than the value required, the low basin inflow indicator is triggered.

The basin inflow is total flow above the APC projects excluding Lake Allatoona and Carters Lake. It is the sum of local flows, minus lake evaporation and diversions. Figure 1.2-5 illustrates the local inflows to the Coosa and Tallapoosa basin. The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Lake Allatoona and Carters Lake. The intent is to capture the hydrologic condition across APC projects in the Coosa and Tallapoosa basins.

Table 1.2-2
Low basin inflow guide (in cfs-days)

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	7Q10 flow	Required Basin Inflow
Jan	629	0	629	4,640	5,269
Feb	647	1,968	2,615	4,640	7,255
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,268	4,640	8,908
May	242	0	242	4,640	4,882
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–602	–1,304	–1,906	4,640	2,734
Oct	–1,331	–2,073	–3,404	4,640	1,236
Nov	–888	–2,659	–3,547	4,640	1,093
Dec	–810	–1,053	–1,863	4,640	2,777

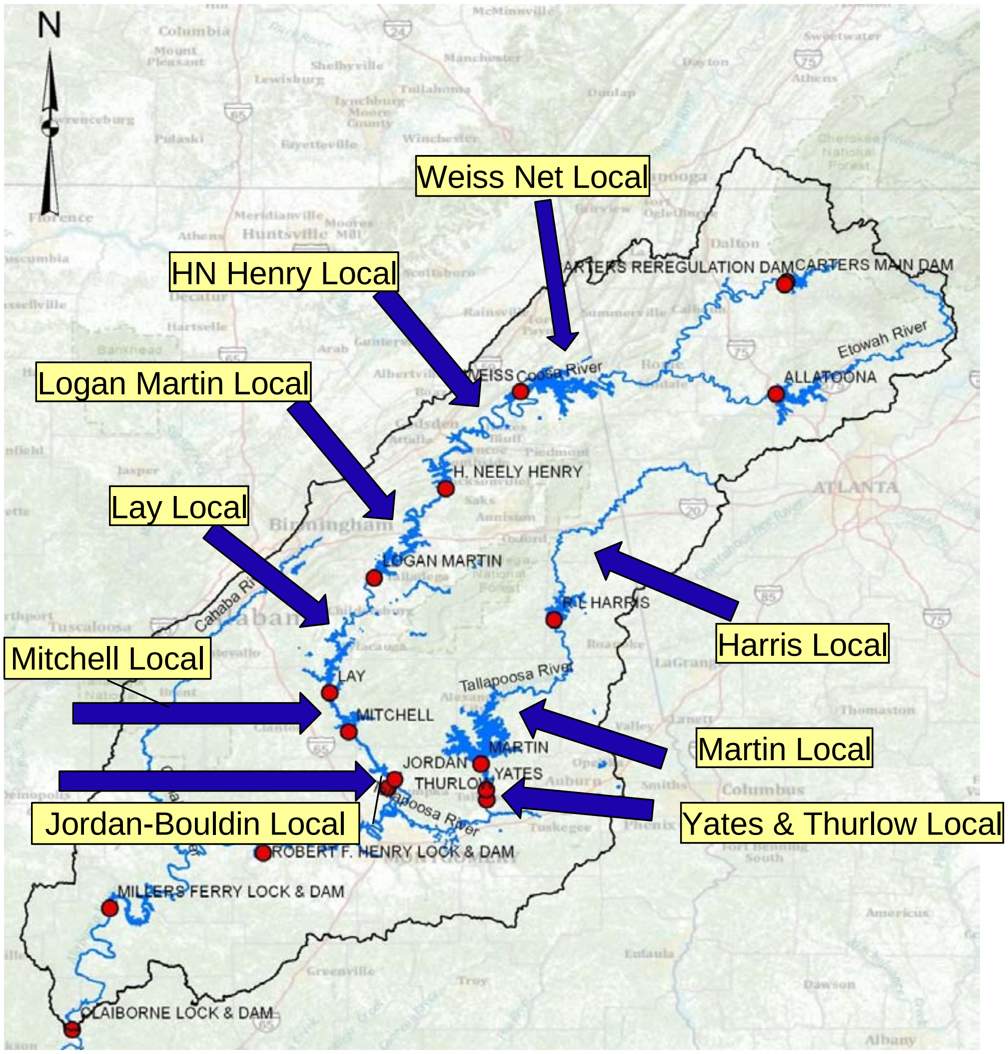


Figure 1.2-5 ACT Basin inflows.

1.2.1.4 State Line Flow Trigger

A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow. The 7Q10 flow is defined as the lowest flow over a 7-day period that would occur once in 10 years. Table 1.2-3 lists the Mayo's Bar 7Q10 value for each month. The lowest 7-day average flow over the past 14 days is computed and checked at the 1st and 15th of the month. If the lowest 7-day average value is less than the Mayo's Bar 7Q10 value, the low state line flow indicator is triggered. If the result is greater than or equal to the trigger value from Table 4.2-5, the flow is considered normal, and the state line flow indicator is not triggered. The term *state line flow* is used in developing the drought management plan because of the proximity of the Mayo's Bar gage to the Alabama-Georgia state line and because it relates to flow data upstream of the Alabama-based APC reservoirs. State line flow is used only as a source of observed data for one of the three triggers and does not imply that *targets* exist at that geographic location. The APCDOP does not include or imply any Corps operation that would result in water management decisions at Carters Lake or Lake Allatoona.

Table 1.2-3
State line flow trigger

Month	Mayo's Bar (7Q10 in cfs)
Jan	2,544
Feb	2,982
Mar	3,258
Apr	2,911
May	2,497
Jun	2,153
Jul	1,693
Aug	1,601
Sep	1,406
Oct	1,325
Nov	1,608
Dec	2,043

Note: Based on USGS Coosa River at Rome Gage (Mayo's Bar, USGS 02397000) observed flow from 1949 to 2006

1.2.1.5 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, Lake Martin, and Weiss Lake projects. Figure 1.2-6 plots the APC composite zones. Figure 1.2-7 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 one storage, the low composite conservation storage indicator is triggered. That computation is performed on 1st and 15th of each month, and is compared to the low state line flow trigger and basin inflow trigger.

1.2.1.6 Operations for Corps Projects Downstream of Montgomery

Drought operations of the Corps' Alabama River projects (R.E. "Bob" Woodruff Lake [Robert F. Henry Lock and Dam], and William "Bill" Dannelly Lake [Millers Ferry Lock and Dam]) will respond to drought operation of the APC projects. When combined releases from the APC projects are reduced to the 7Q10 flow of 4,640 cfs, the Corps' Alabama River projects will operate to maintain a minimum flow of 6,600 cfs below Claiborne Lake. When the APCDOP requires flows less than 4,640 cfs, the minimum flow at Claiborne Lake is equal to the inflow into Millers Ferry Lock and Dam. 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.

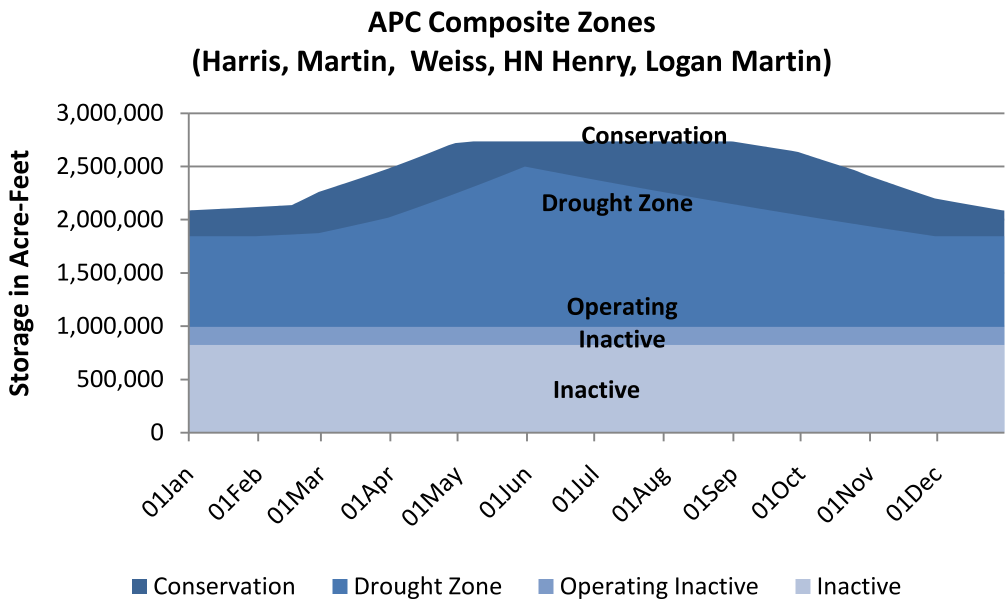


Figure 1.2-6 APC composite zones.

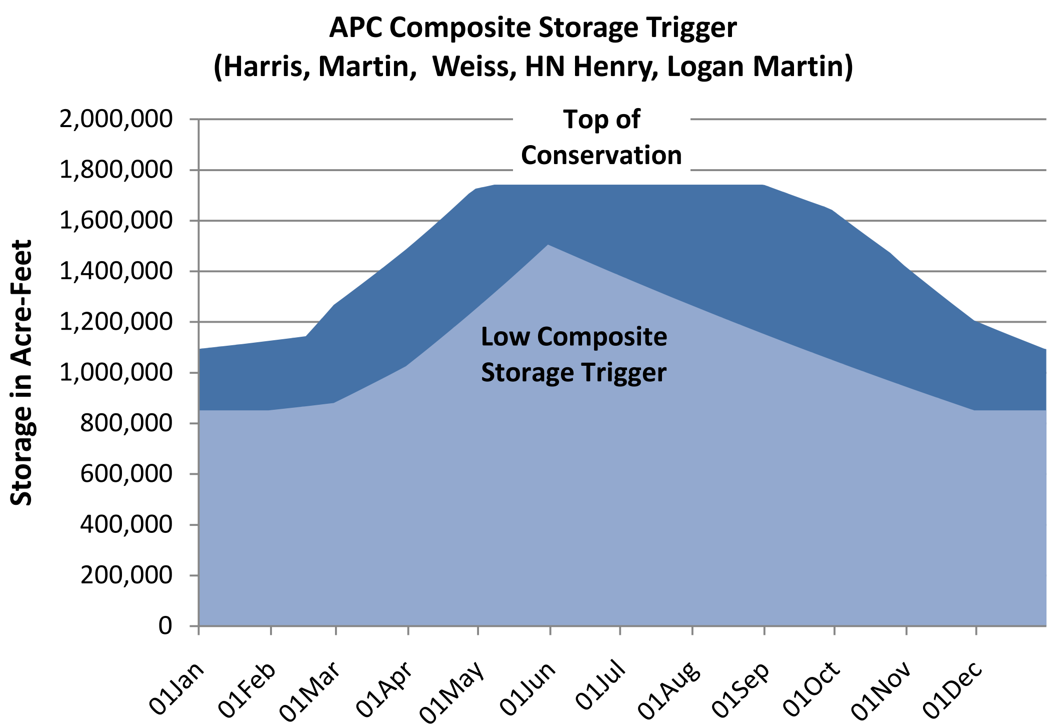


Figure 1.2-7 APC low composite conservation storage drought trigger.

2 RESPONSE TO PLANNING AID LETTER (PAL)

2.1 Low DO below reservoirs and meeting of State water quality standards.

In accordance with ER 1110-2-8154, *Water Quality and Environmental Management for Corps Civil Works Projects*, the Corps has an objective to ensure that water quality, as affected by a Corps project and its operation, is suitable for project purposes, existing water uses, and public safety and is in compliance with applicable federal and state water quality standards. The States currently monitor data throughout the summer low-flow period in reservoirs to ensure water quality standards are met.

Water quality was taken into account when updating water control plans and manuals. The information contained in the following sections demonstrates the effects of the No Action Alternative and Preferred Alternative on water quality.

HEC-ResSim model is being used to simulate flow operations in the ACT Basin. HEC-ResSim is a state-of-the-art tool for simulating flow operations in managed systems. It was developed by the Corps' Hydrologic Engineering Center (HEC) to help engineers and planners perform water resources studies in predicting the behavior of reservoirs and to help reservoir operators plan releases in real-time during day-to-day and emergency operations. Version 3.0 of the HEC-ResSim model was released in April 2007. The Corps HEC also developed HEC-5Q to provide an analytic tool for evaluating the water quality response. This model is linked with the HEC-ResSim model through an input of flows by reach. For this EIS, the enhanced HEC-5Q developed for the Columbia River Basin was generalized and improved to evaluate the effects of ACT project operations on basin water quality. The HEC-5Q model was linked with the HEC-ResSim model through an input of flows by reach to examine the effects on water quality in the mainstems of the ACT Basin. The HEC-5Q results presented in this section are for the modeled period (2001–2008).

The purpose of simulating conditions over this period (2001 – 2008) was not to capture historical changes in water quality; rather, the intent was to capture the range of potential hydrologic conditions that influence water quality. The modeled period includes wet, dry, and normal rainfall conditions, which allows a display of the water quality response to varying hydrologic conditions. The wet, dry, and normal rainfall years presented are 2003, 2007, and 2002, respectively. Those years were selected to represent the range of hydrologic conditions that can occur understanding that conditions can vary greatly over the entire basin.

The sections to follow present the change (or *delta*) in various modeled parameters between the No Action Alternative, Plan D, Plan F, and the Proposed Action Alternative. These four alternatives have been evaluated in detail; however, for the purpose of this response, only the Proposed Action Alternative will be described. The longitudinal occurrence profiles by rivermile (RM) illustrate how water quality varies along the reach, and how water quality might be affected by dams, other structures, or discharges from point and nonpoint sources. Presenting data in such a way illustrates the amount of time a concentration is higher or lower than a given value. In those plots, the 5th, 50th (or median), and 95th percent occurrences are illustrated. Those percentiles illustrate the range of concentrations that would be likely to occur. Such profiles illustrate the percentage of time a concentration of pollutant occurs as a *Percent Occurrence* at stations in mainstem sections of the ACT Basin.

The median values reflect the points at which 50 percent of the calculated values are higher and 50 percent are lower. The 95th percent occurrence and 5th percent occurrence bracket the range of high and low calculated values that rarely occur. For example, a DO plot showing a 5 percent occurrence level at 5 mg/L means that 5 percent of the observations were lower than that concentration. An occurrence level of 95 percent at 12 mg/L shows that 95 percent of modeled concentrations fell below 12 mg/L. Conversely, that would indicate that 5 percent of the model values were higher than 12 mg/L. Presenting modeled results that way should help readers understand the response of the system without allowing the data from extreme events to skew the results. Note that the percent occurrence is the opposite of the percent exceedence.

It is also important to understand that critical conditions for water quality parameters vary under different flow and water temperature conditions. For example, water temperatures increase in warm weather months and in low stream flow conditions. In wet weather conditions, nutrient concentrations may increase. For this reason water quality conditions are defined for representative wet, dry, and normal weather conditions. State and federal agencies also define warm weather months, or the *growing season*, in different ways for regulatory purposes. The figures to follow illustrate annual conditions as well as growing seasons defined by May through October and April through November.

2.1.1 Total number of days with dissolved oxygen (DO) below a daily average of 5.0 mg/L

The total number of days with a daily average DO less than 5.0 mg/L was not calculated. However, the occurrence of DO was plotted and compared between alternatives at various locations in the basin. In general, the proposed operational changes would be expected to have a negligible effect on DO for much of the ACT Basin. In the figures presented below, the results generally overlay each other, and the differences between alternatives are indistinguishable. As described in the PAL, the lowest DO concentrations occur in dam tailraces. Despite low concentrations of dissolved oxygen in dam tailraces, the Proposed Action Alternative generally is equal to the No Action Alternative as illustrated in Figures 2.2-1 through 2.2-5.

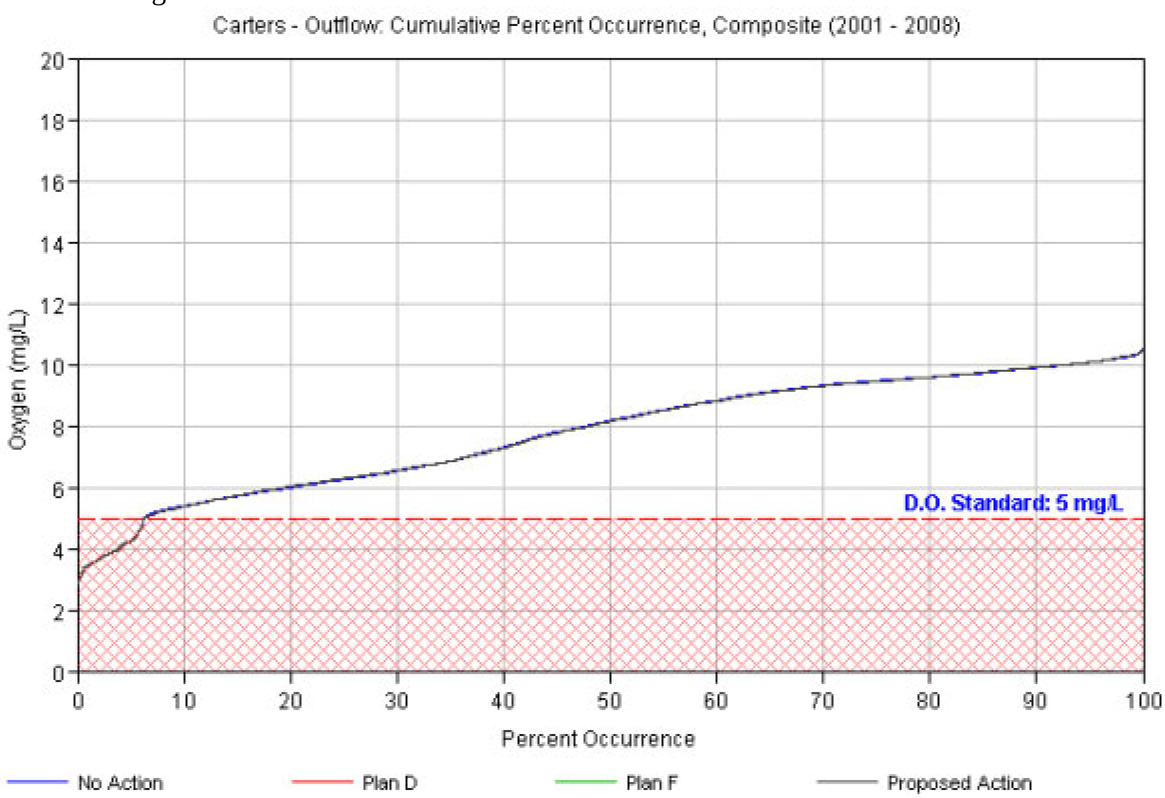


Figure 2.1-1 Carters Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

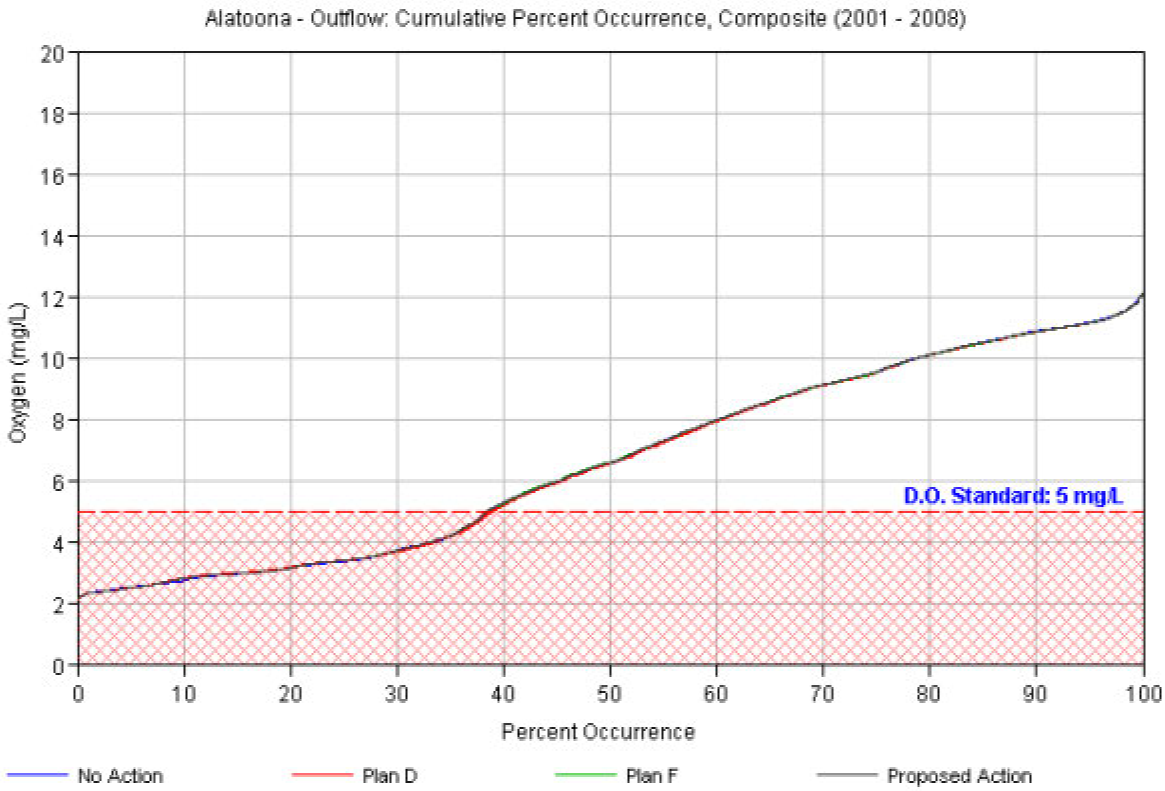


Figure 2.1-2 Allatoona Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

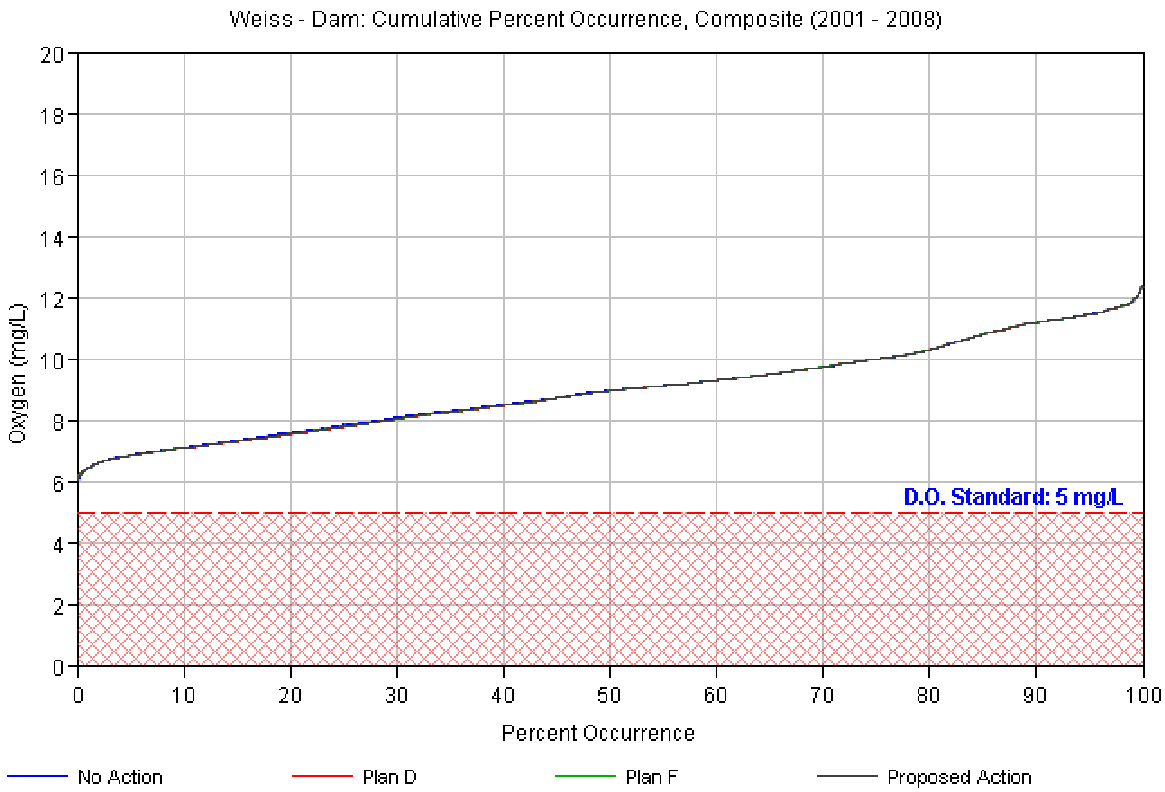


Figure 2.1-3 Weiss Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

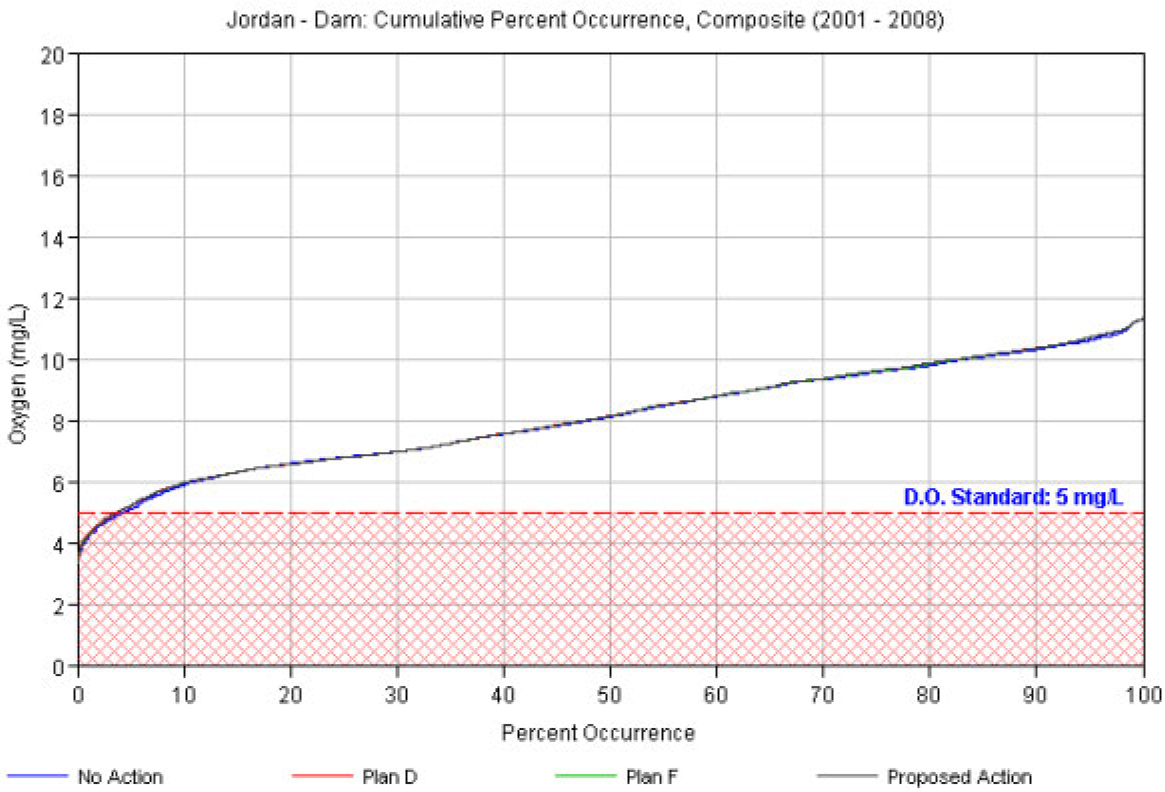


Figure 2.1-4 Jordan Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

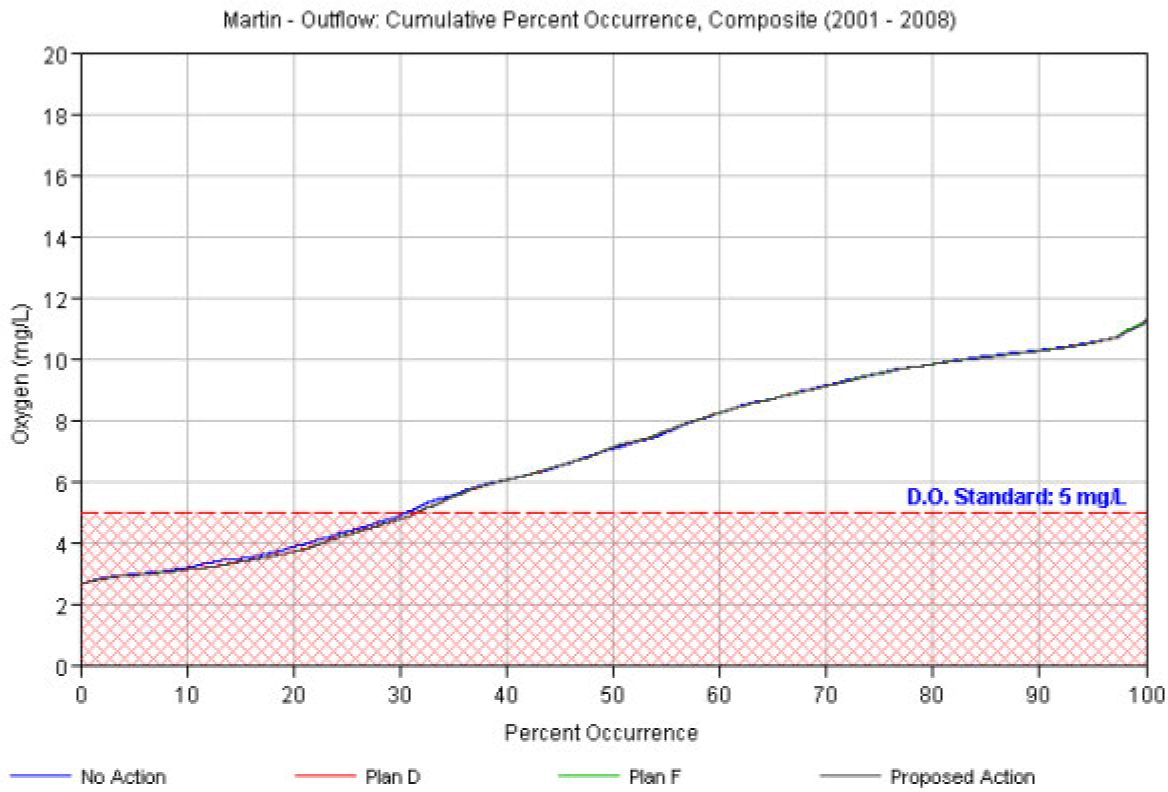


Figure 2.1-5 Martin Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

The previous figures illustrate the lowest DO concentrations in dam tailraces throughout the basin. Low DO also occurs at Cartersville, Georgia (Figure 2.1-6). However, again a comparison of the No Action Alternative to various alternatives illustrates little change.

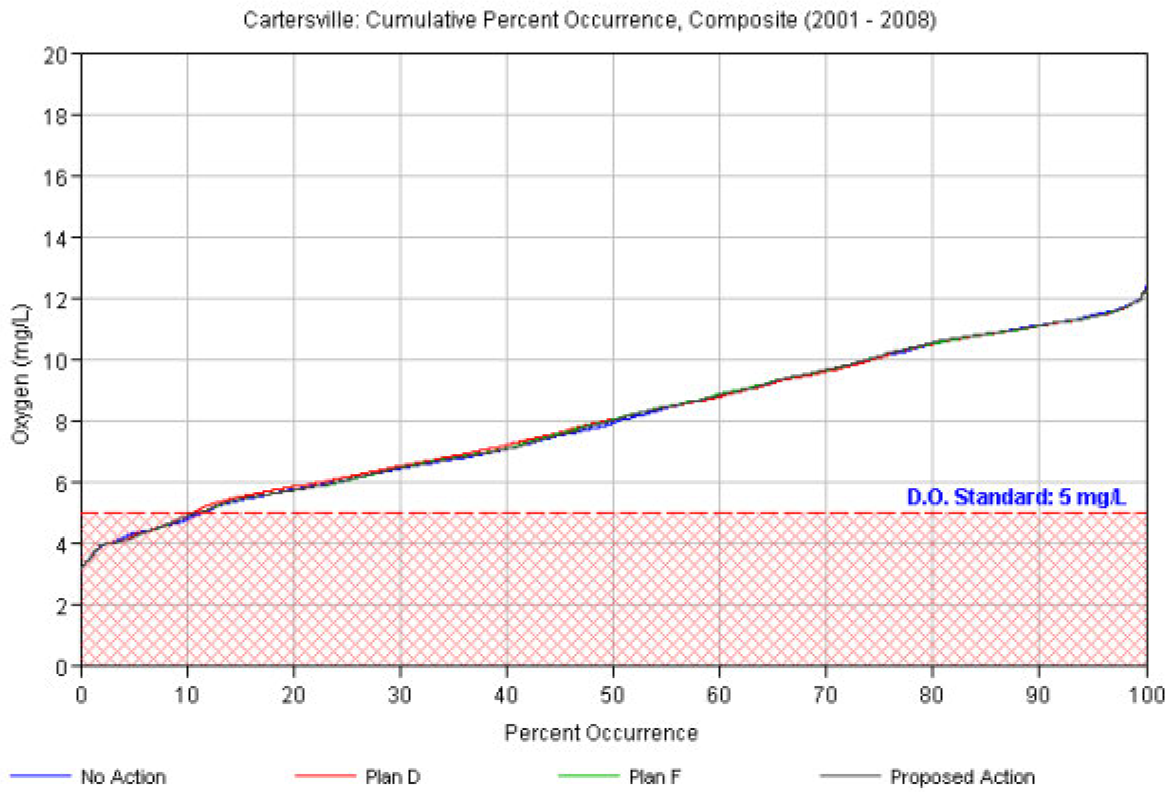


Figure 2.1-6 Cartersville, Georgia outflow dissolved oxygen for the modeled period (2000 – 2008).

The difference between the alternatives evaluated is the greatest downstream of Carters Lake (Figure 2.1-7) and at the confluence of the Coosa and Tallapoosa Rivers (between RM 300 and 350 on the Alabama River, Figure 2.1-8). Differences are the greatest during periods of dry weather conditions when drought operations are likely to be implemented. However, modeled differences from the No Action alternative are generally less than 0.5 mg/l.

Changes in releases from Carters Lake under the drought plan decrease DO downstream of the dam. DO recovers to concentrations near the No Action Alternative before Pine Chapel, 20 mi downstream (Figure 2.1-7).

In the Coosa River, changes in DO are also the greatest in a dry-weather year (Figure 2.1-9). In dry-weather periods, it would be expected that the Corps would operate for drought management. In much of the Coosa River, median DO concentrations during dry-weather periods would be expected near conditions similar to the No Action Alternative. However, DO downstream of Weiss Dam and Neely Henry Dam would be expected to be reduced during the growing season in dry-weather years. Downstream of Weiss Lake, median DO would be expected to decrease by nearly 1.0 mg/L. As illustrated in Figure 2.1-3, median DO over the modeled period is well above water quality standards at 8 mg/L. Median DO decreases by nearly 0.5 mg/L immediately downstream of Neely Henry Dam. Immediately downstream of other reservoirs (Jordan Dam and Lake, Mitchell Dam, and Logan Martin Dam), the median DO concentrations would be expected to increase by as much as 0.5 mg/L by the Plan D, Plan F, and the Proposed Action Alternative.

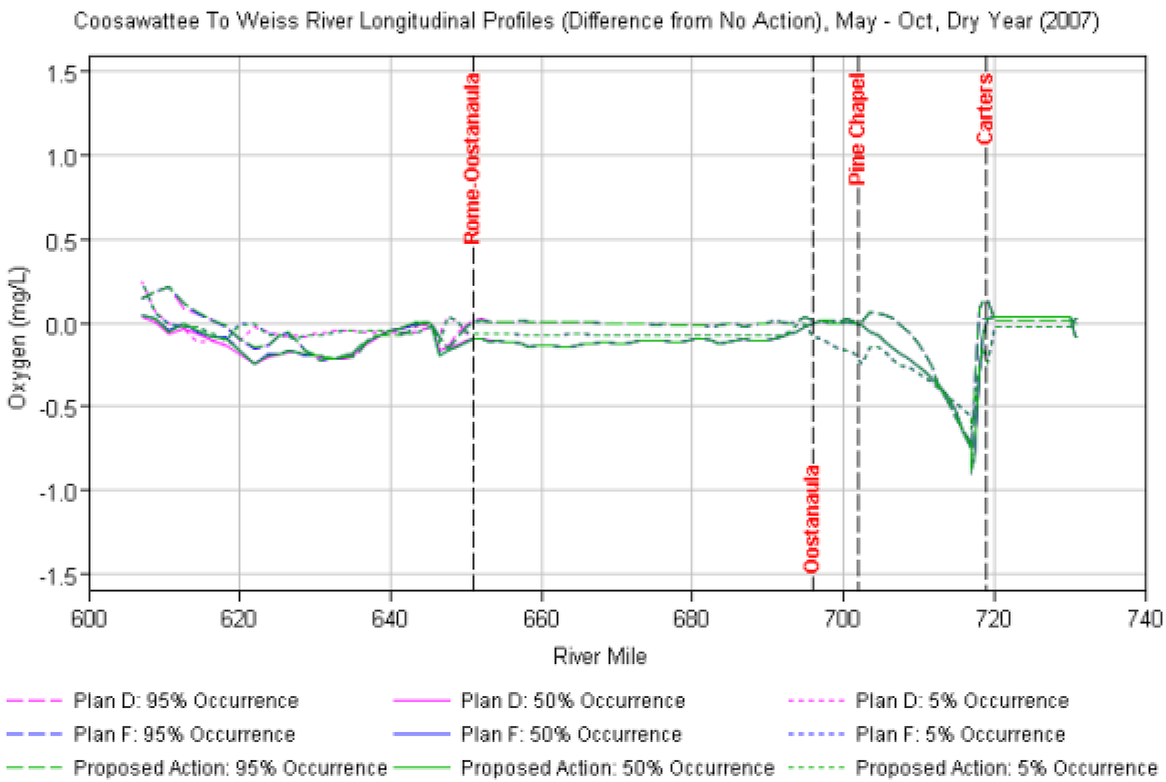


Figure 2.1-7 Oxygen longitudinal profile for May to October in a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

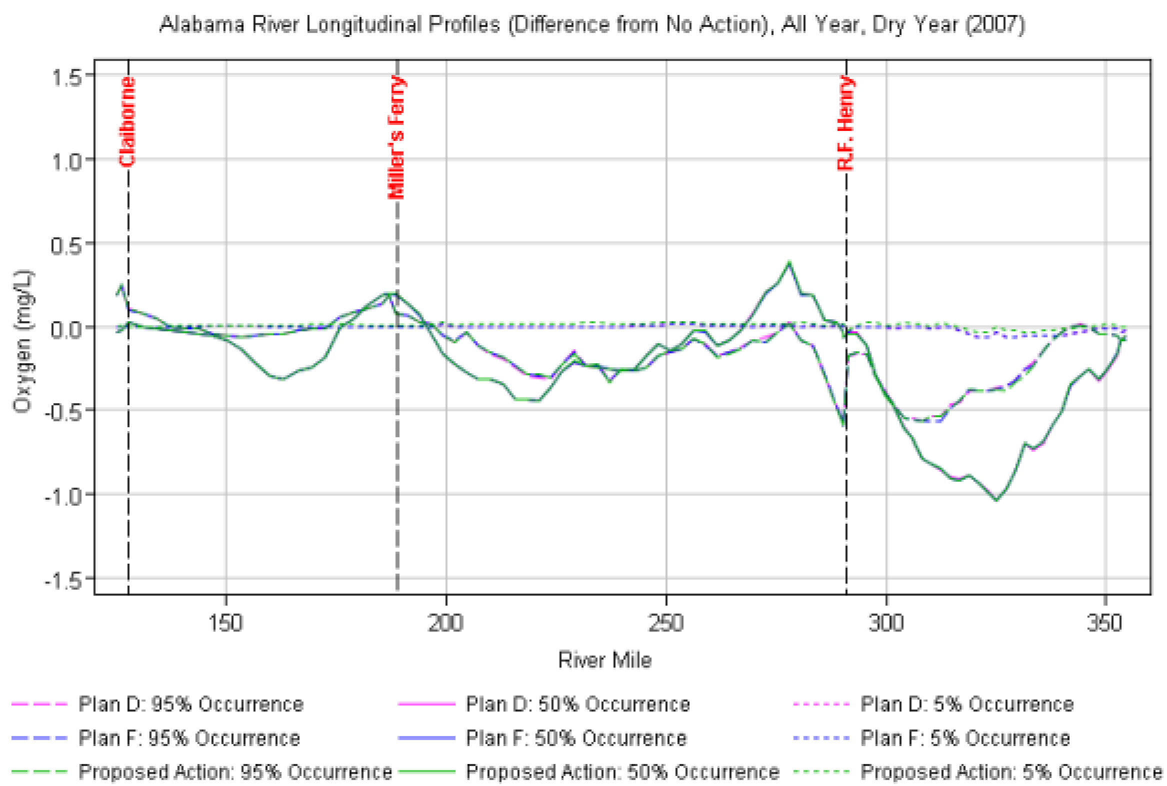


Figure 2.1-8 Alabama River oxygen longitudinal profile for a representative dry-weather year (2007).

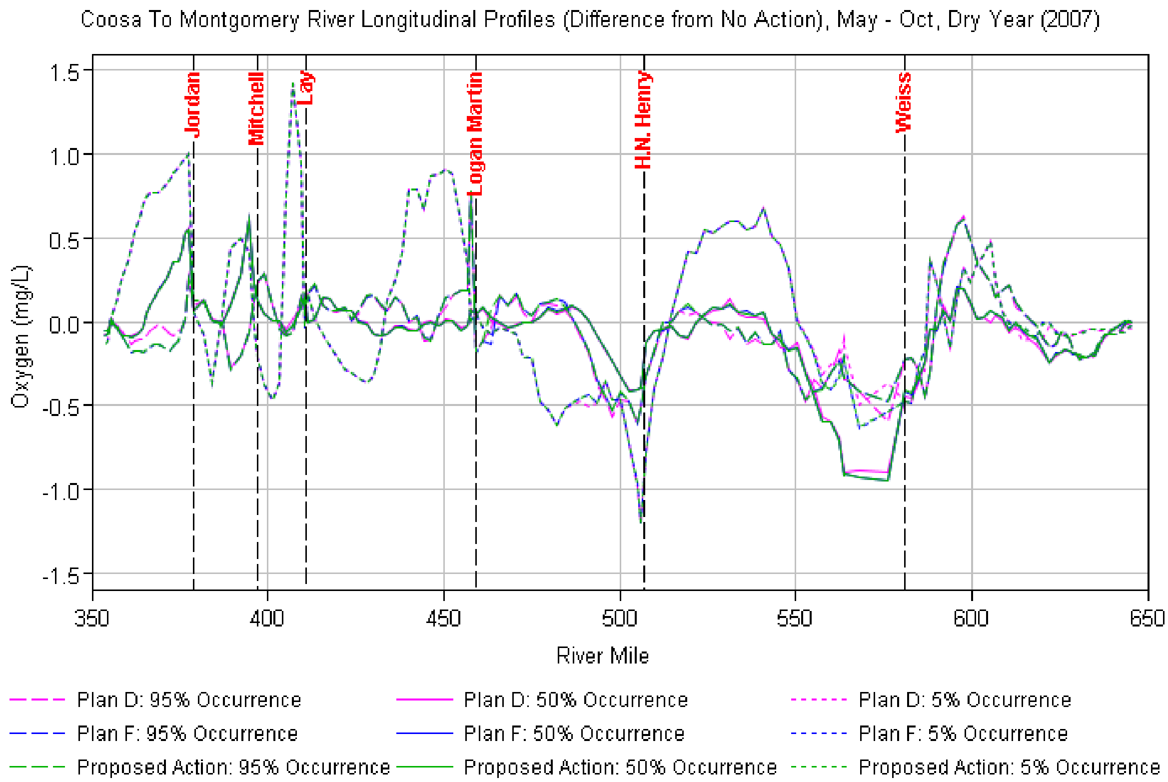


Figure 2.1-9 Coosa River oxygen longitudinal profile for May to October in a representative dry-weather year (2007).

In reservoirs with deep forebays, oxygen is often higher at the water surface and lower with depth through the water column. Reservoirs that release from deep water often release low oxygen water downstream. That is generally more pronounced in dry-weather years when inflows to reservoirs are low and retention times in reservoirs increase. That is illustrated by comparing Figures 2.1-7 and 2.1-10. The plots illustrate the Alabama River in a representative dry- and wet-weather year, respectively. The reason for the differences among alternatives is that each one uses different dam operations for drought management through a series of triggers. Those drought triggers change the way water is released during periods of drought in the ACT Basin.

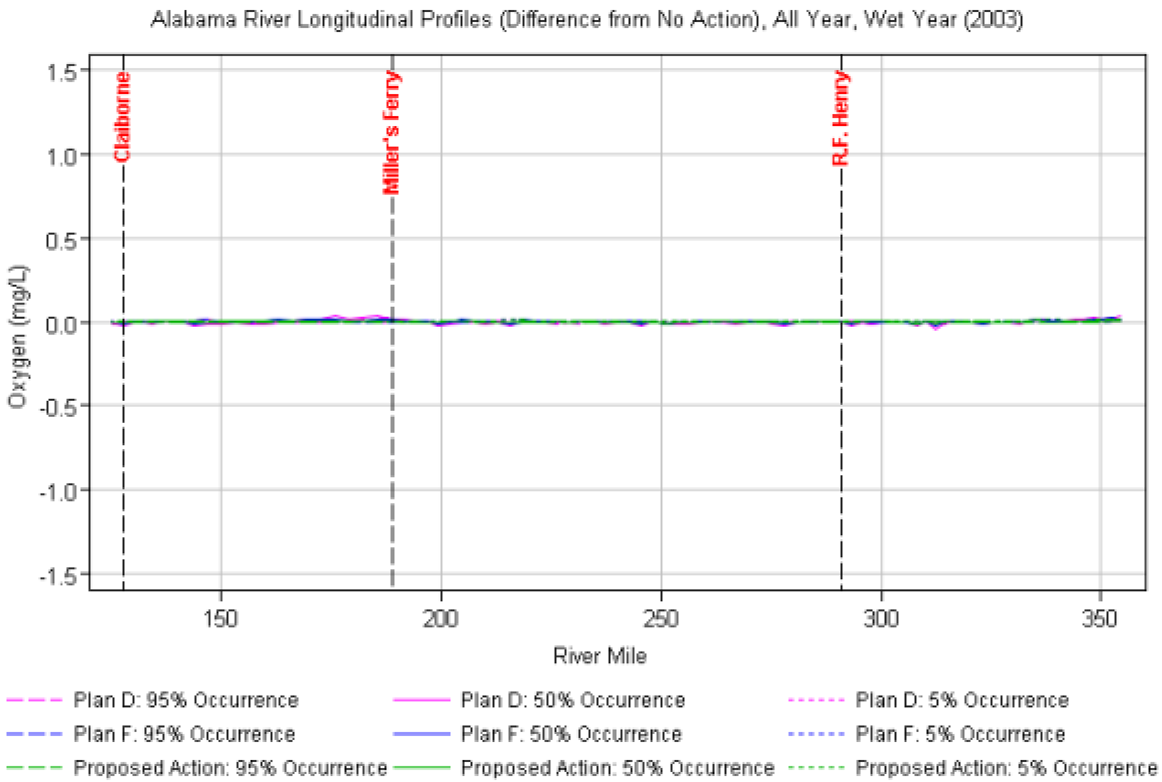


Figure 2.1-10 Alabama River oxygen longitudinal profile for a representative wet-weather year (2003).

Median DO downstream of Lake Allatoona in the Etowah River have little change for the No Action Alternative over the modeled period (Figure 2.1-11).

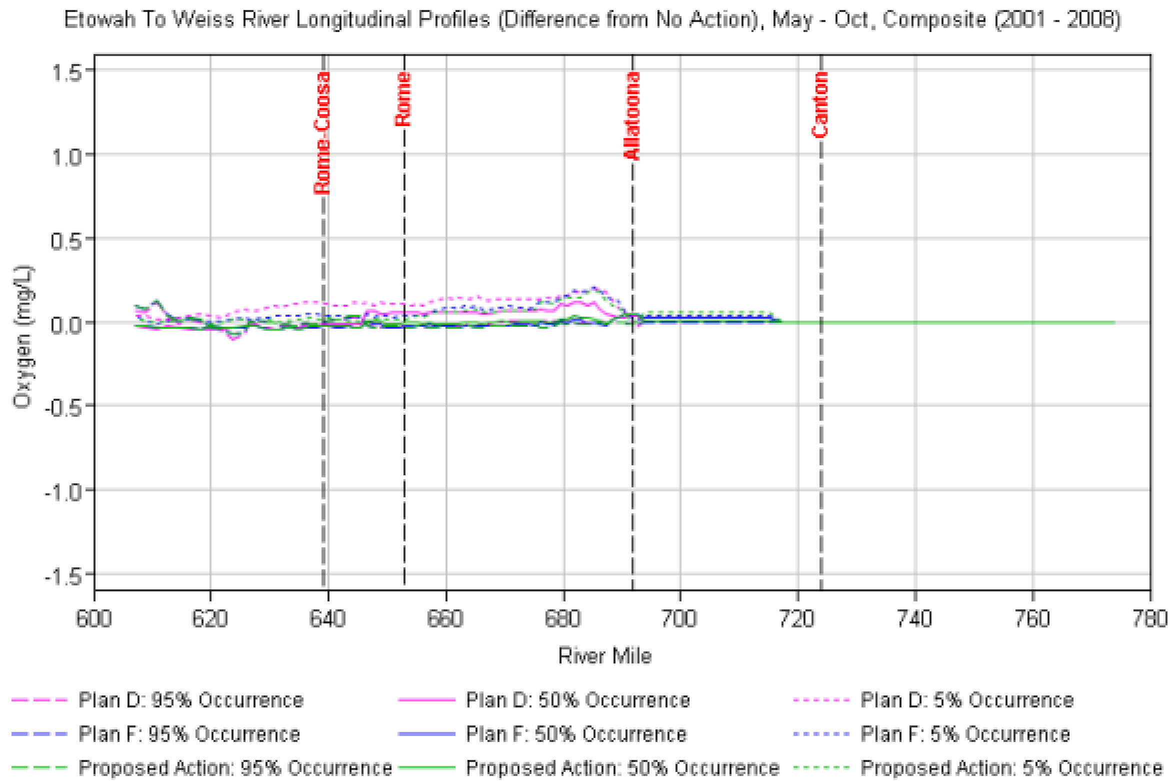


Figure 2.1-11 Etowah River oxygen longitudinal profile for May to October over the modeled period (2001 - 2008).

DO in the Tallapoosa River fluctuates immediately downstream of dams from May through October in a representative dry-weather year (Figure 2.1-12). Those fluctuations would be expected to occur at conditions near water quality standards; 4 mg/L downstream of dams.

In summary, our modeled evaluation of the impacts of the proposed action indicate that any declines in DO compared to the current operation of the Corps reservoirs would be isolated and usually less than 0.5 mg/l. Those declines would be most pronounced during extreme drought (5th percentile occurrence) and in some cases declines up to 1.0 mg/l could be seen. For the most part, the preceding graphs indicate that the proposed action would cause insignificant changes from the No Action alternative. In some cases the model indicates increases in DO up to about 1.0 mg/l. For Lake Allatoona releases, which the PAL identified as a specific concern, there would be little difference from current operations even in the extreme drought condition.

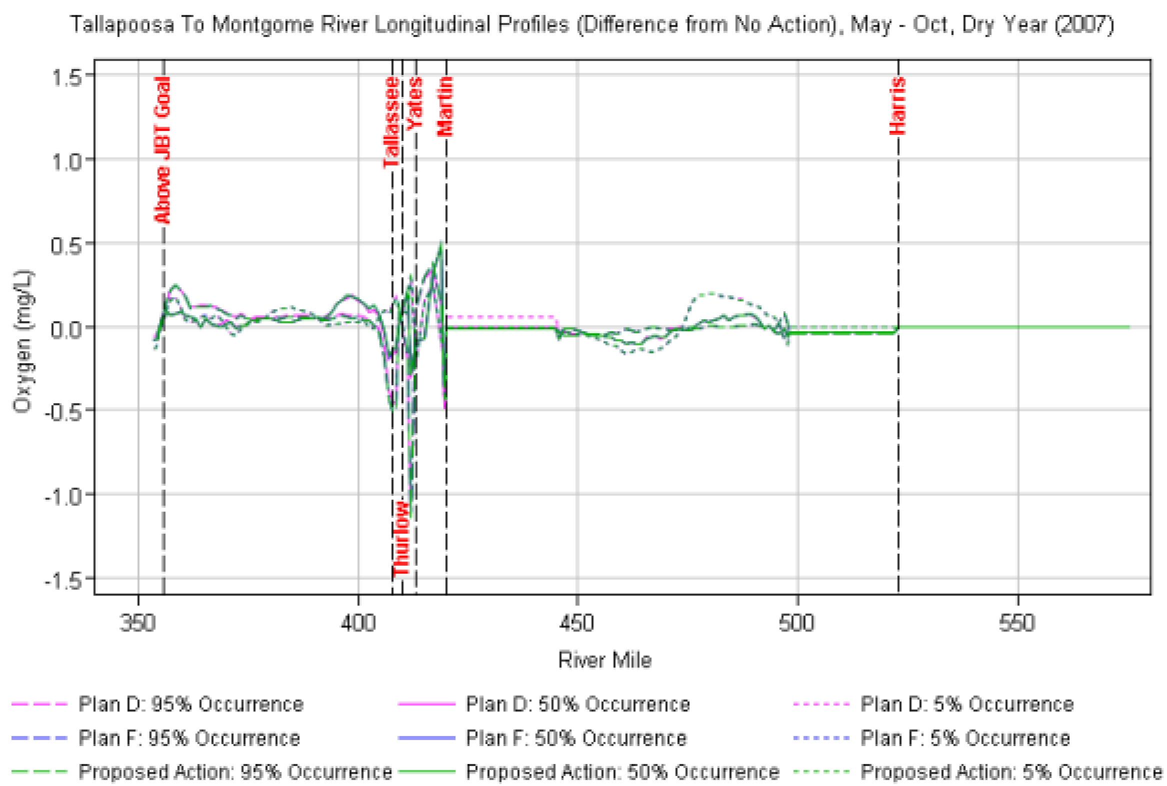


Figure 2.1-12 Tallapoosa River oxygen longitudinal profile for May to October in a representative dry-weather year (2007).

2.1.2 Total number of instantaneous "measurements" less than 4.0 mg/L

HEC5Q doesn't have the ability to simulate instantaneous DO. The river profile simulations suggest that DO values less than 4 mg/L are only expected at several tailrace locations (as illustrated in Figures 2.1-1 through 2.1-5).

2.1.3 Monthly exceedence figures and box plots with outliers for water temperature

Monthly exceedence figures for water temperature were not generated. The operational changes in the Proposed Action Alternative would be expected to affect water temperature along reaches of the ACT Basin where changes in DO were predicted. The largest fluctuations in water temperature were predicted at the confluence of the Coosa and Tallapoosa Rivers into the Alabama River. Along this reach the Proposed Action Alternative would be expected to increase median water temperatures by more than 1.8 °F (1°C) in a representative dry year (Figure 2.1-13).

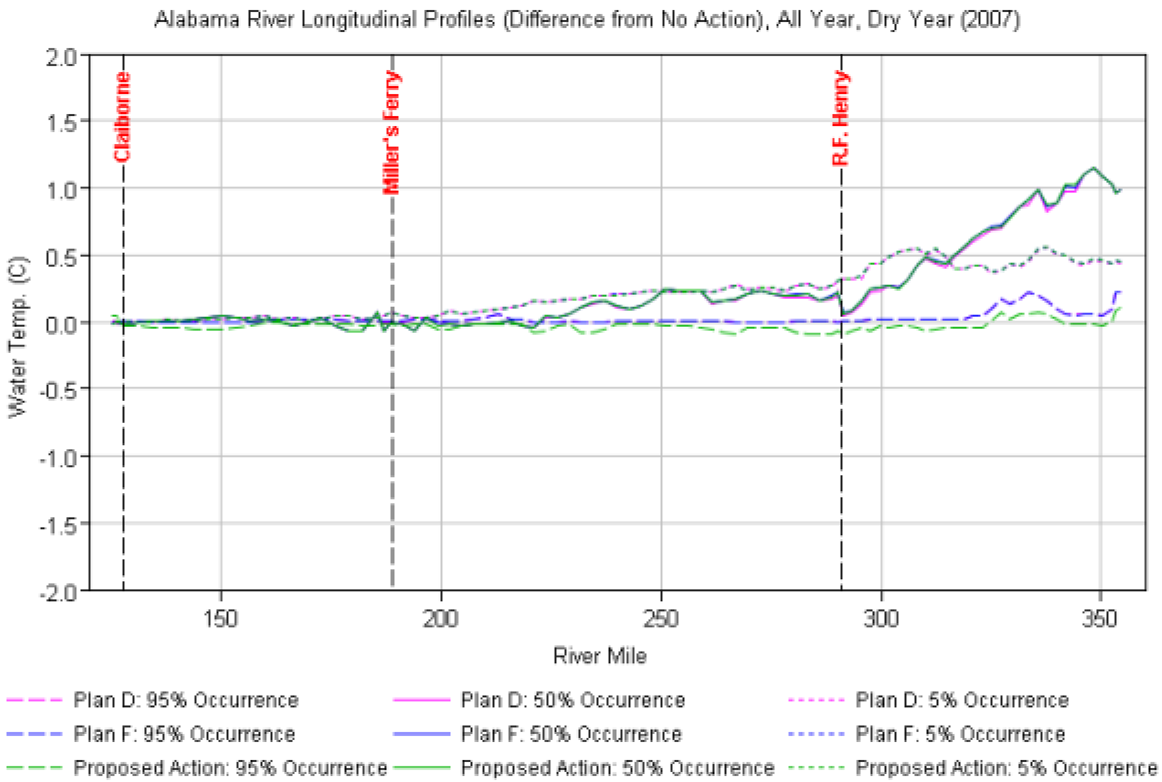


Figure 2.1-13 Alabama River longitudinal profile of water temperature in a representative dry-weather year (2007).

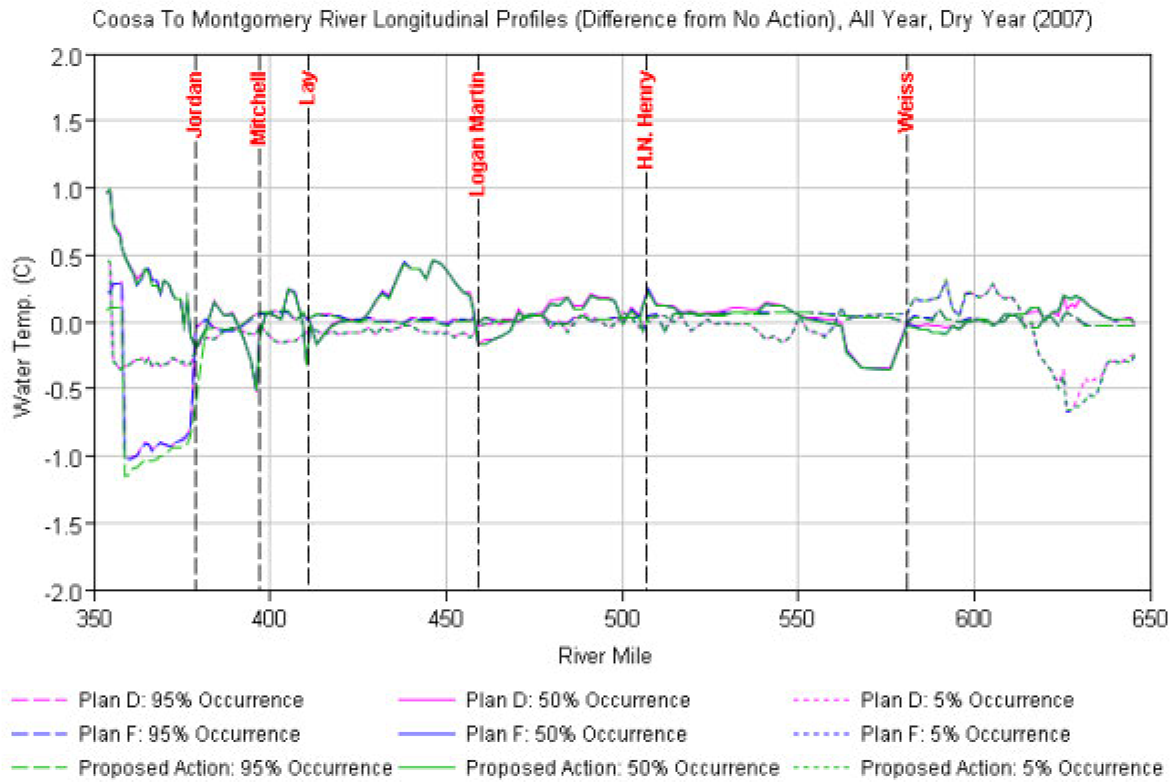


Figure 2.1-14 Coosa River water temperature longitudinal profile for a representative dry-weather year (2007).

The changes in modeled water temperature from the No Action Alternative have the greatest variation during periods when drought operations are likely to occur. However, the range of water temperatures predicted by the model as a change between various alternatives and the No Action Alternative would not be expected to be as great under observed conditions (Figure 2.1-14). APC operates Jordan Dam and Lake to ensure minimum flows (2,000 cfs) for protected species. The Corps HEC-ResSim modeled flows were less than what would actually be released during periods of drought. Therefore, as previously stated, water temperatures would not be expected to decrease as much as 1.8 °F (1 °C).

Little change in water temperature would be expected on the Alabama River over longer periods and when drought conditions have not triggered as seen in Figure 2.1-15. The Alabama River does not have reservoirs with storage but, instead, is dominated by reservoirs with run-of-river operations. Generally storage reservoirs have greater fluctuations in downstream water temperature.

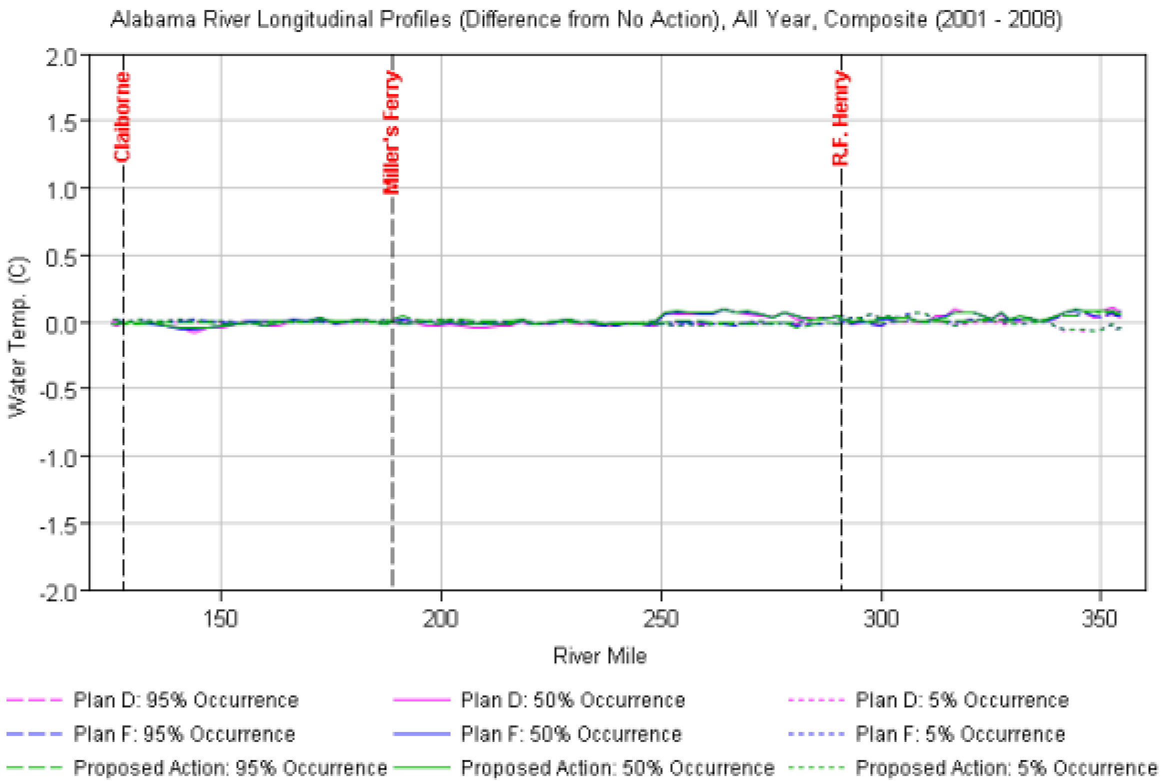


Figure 2.1-15 Alabama River water temperature longitudinal profile for the modeled period (2001–2008).

Water temperature fluctuations downstream of storage reservoirs would be expected directly downstream of Carters Lake. Water temperatures downstream of Carters Lake would be expected to decrease by around 0.7 °F (0.4 °C) and 1.5 °F (0.7 °C) as seen in Figures 2.1-16 and 2.1-17 respectively.

Median water temperatures downstream of the confluence of the Coosawattee and Oostanaula Rivers would be expected to increase by as much as 0.7 °F (0.4 °C) in dry-weather conditions (Figure 2.1-17). The health of aquatic species along the reach is a concern for stakeholders. Looking more closely at periods critical to aquatic species, when water temperatures are greatest, little to no change was modeled on the Oostanaula River (Figure 2.1-16). A decrease in water temperature downstream of Carters Lake during the growing season would likely benefit species. Changes in water temperature in the Coosawattee River would be expected to have negligible effects.

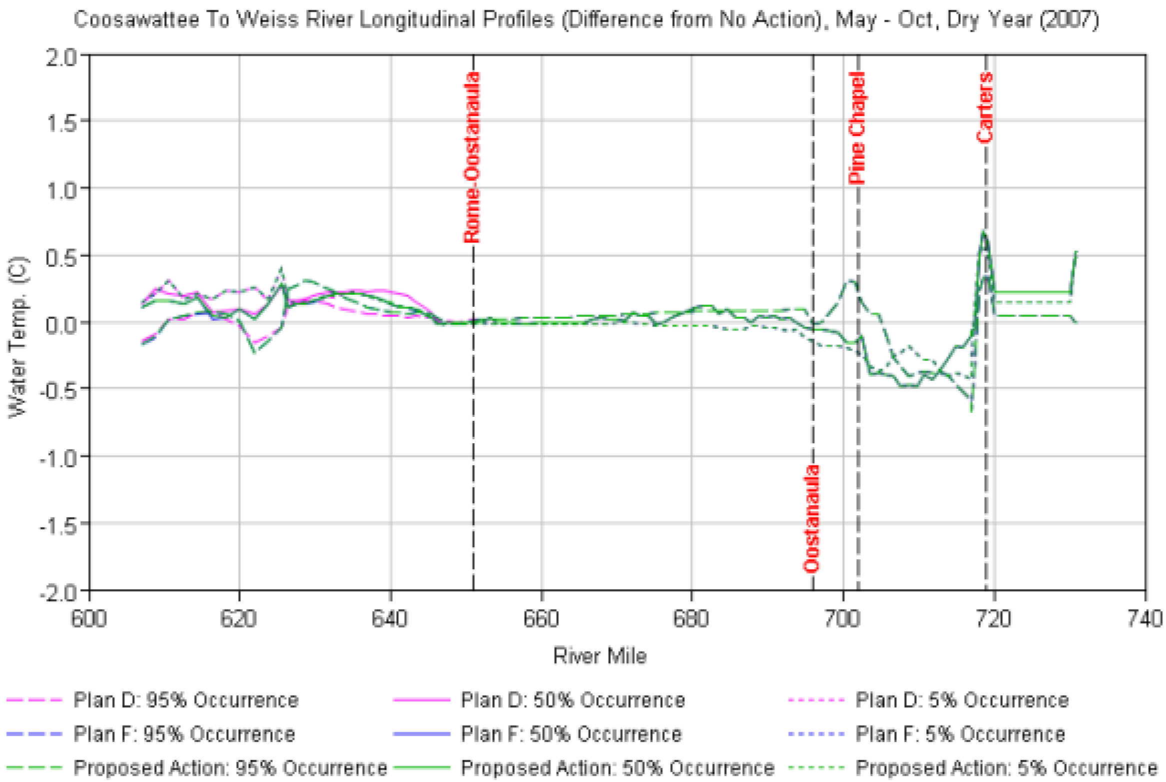


Figure 2.1-16 Water temperature longitudinal profile for a representative dry-weather year during the growing season from May through October (2007) from Carters Lake downstream to Weiss Lake.

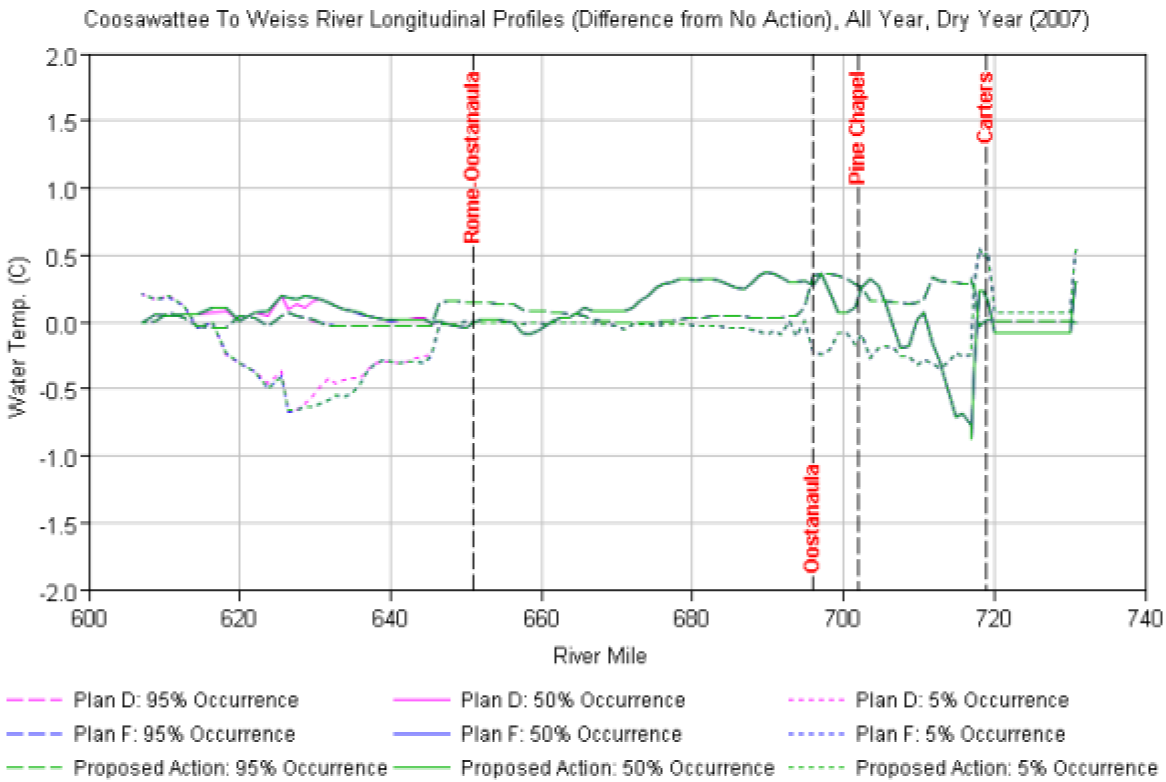


Figure 2.1-17 Water temperature longitudinal profile for a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

Similar to conditions downstream of Carters Lake, median water temperatures downstream of Lake Allatoona would be expected to decrease in dry years (Figure 2.1-18). A decrease in water temperature downstream of Lake Allatoona during the growing season in dry weather conditions would likely benefit aquatic species.

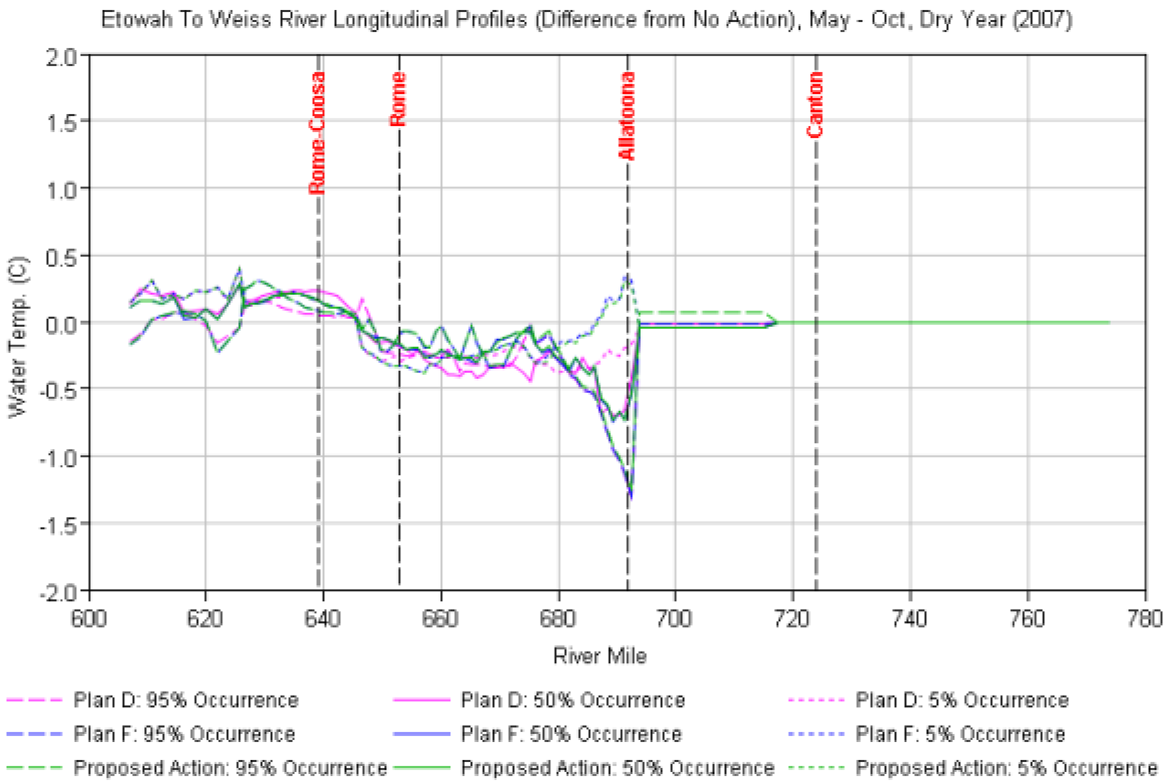


Figure 2.1-18 Etowah River water temperature longitudinal profile May through October for a representative dry-weather year (2007).

In the Tallapoosa River, over the modeled period, little change in water temperature would be expected (Figure 2.1-19). In reaches downstream of Lake Martin, water temperatures would be expected to decrease.

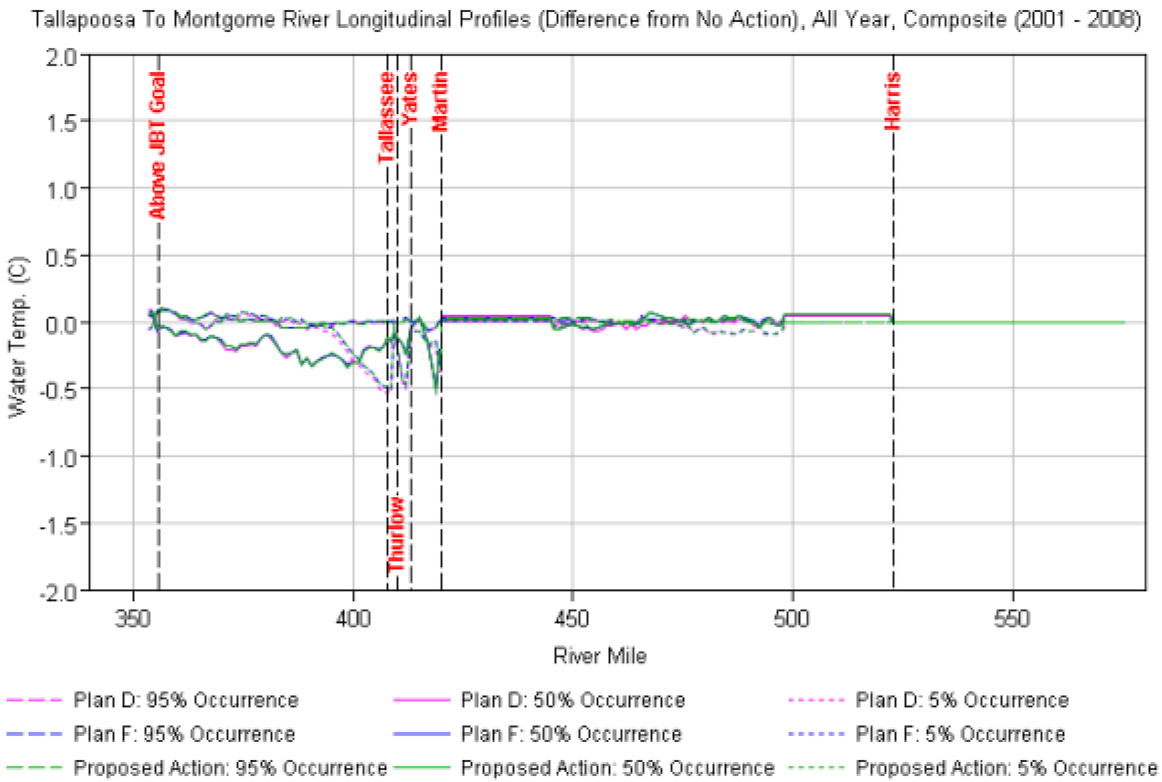


Figure 2.1-19 Tallapoosa River water temperature longitudinal profile for the modeled period (2001-2008).

2.1.4 Average stream percent wastewater

Figures 2.1-20 through 2.1-24 illustrate the percent of wastewater instream at various points in the ACT Basin for a period of low stream flow. From these plots it is clear that wastewater makes up less than 10 percent of the total flow in most cases. A ten mile reach downstream of Rome, Georgia and upstream of Weiss Lake may have a greater percentage of wastewater as illustrated in Figure 2.1-22.

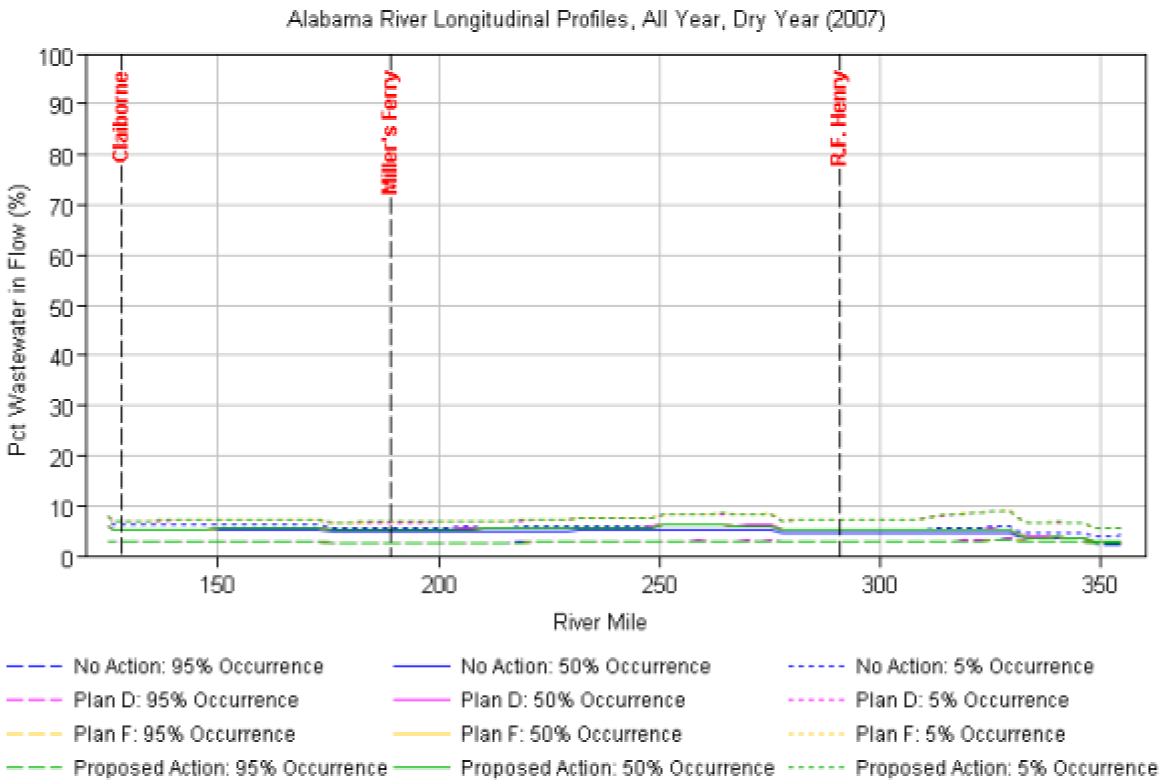


Figure 2.1-20 Alabama River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

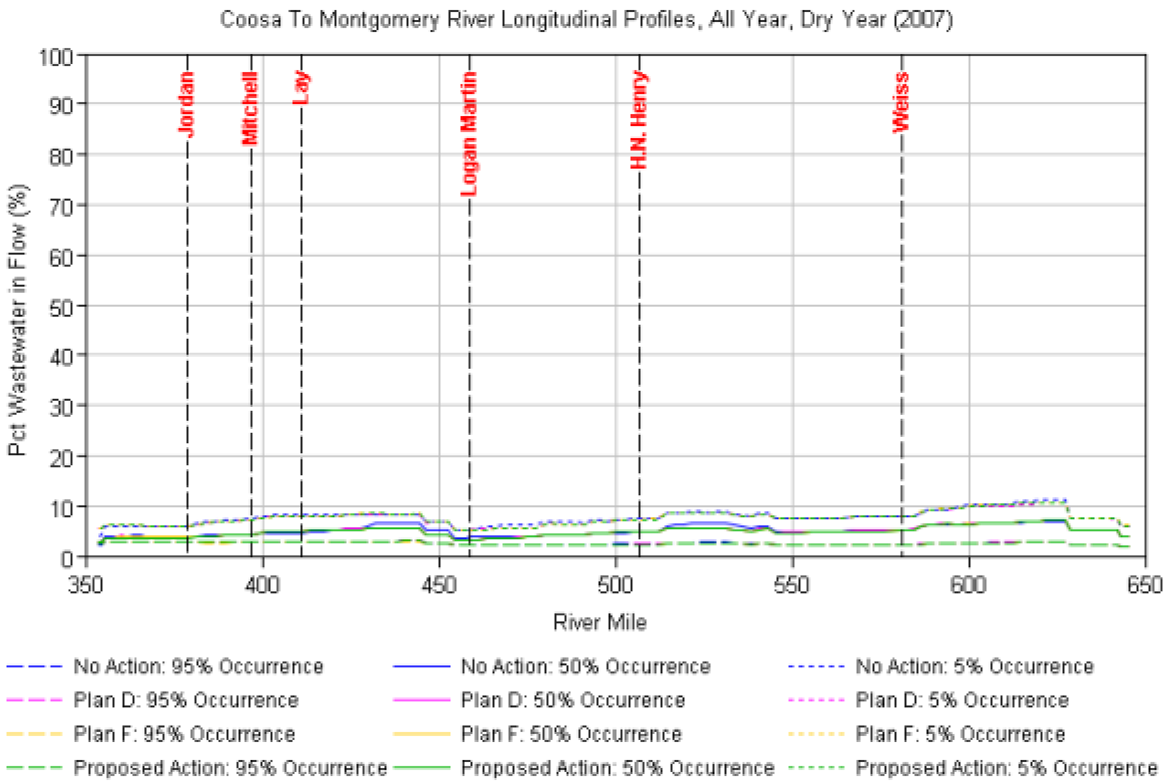


Figure 2.1-21 Coosa River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

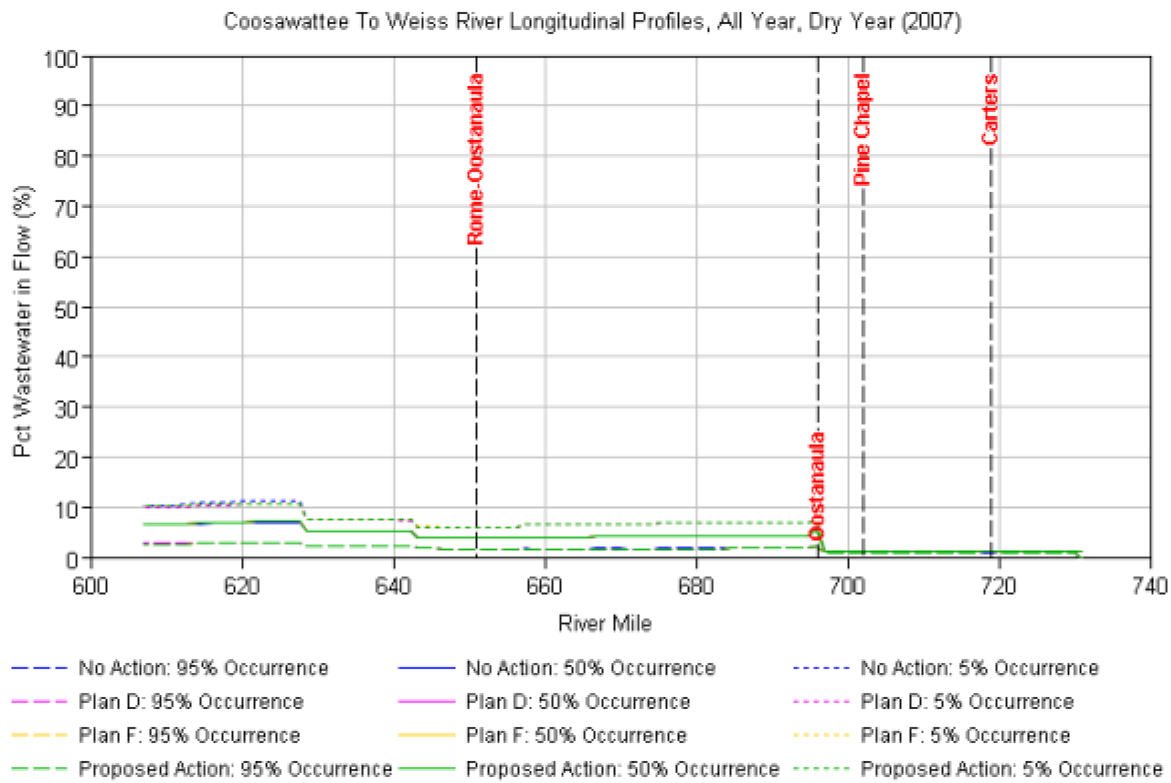


Figure 2.1-22 Coosa, Coosawattee, and Oostanaula rivers longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

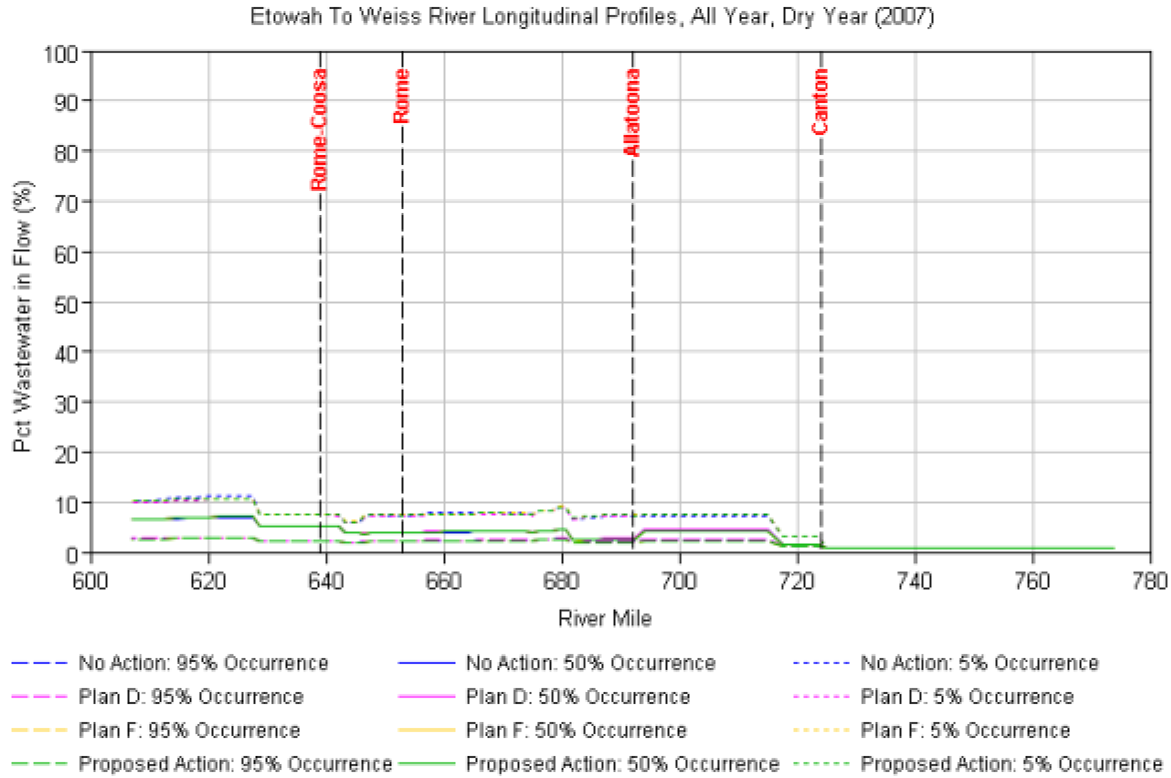


Figure 2.1-23 Etowah and Coosa rivers longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

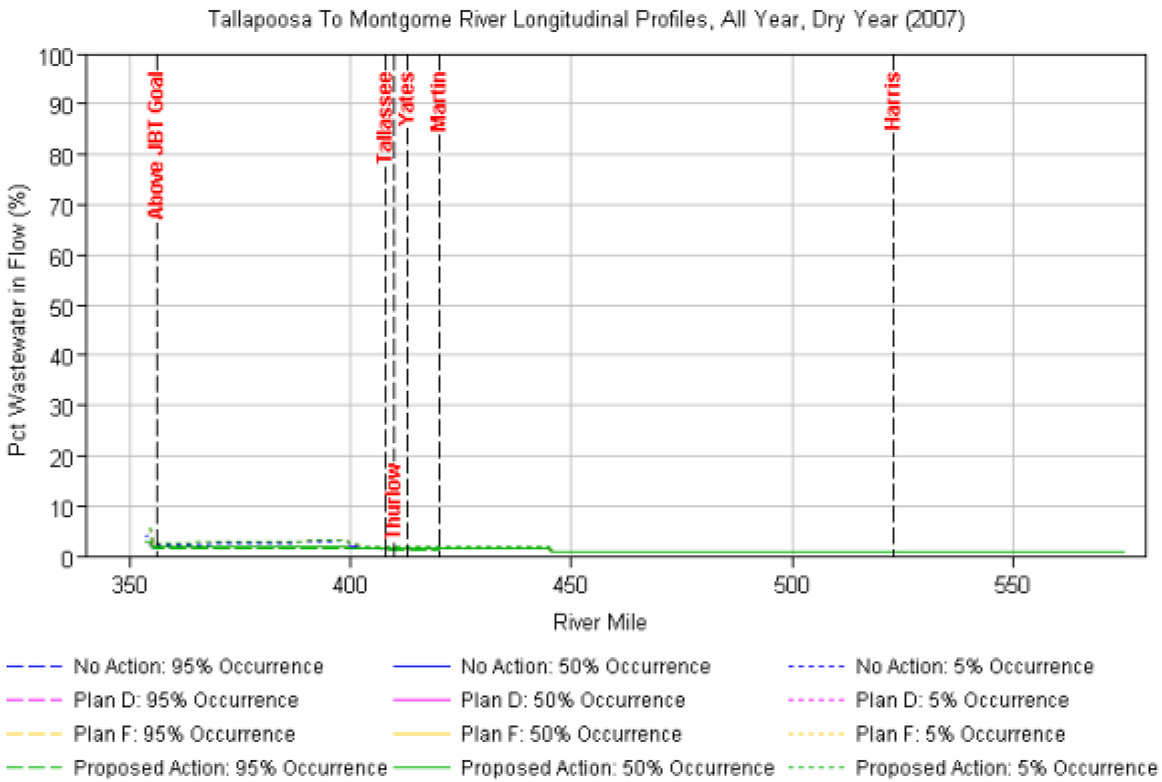


Figure 2.1-24 Tallapoosa River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

2.2 Protection and enhancement of remaining free-flowing river habitats.

Identification and mapping of remaining free-flowing river habitats is generally beyond the scope of the current water control manual update. While the need is recognized, it is not a part of or affected by the Corps' effort to refine its operations to meet current conditions. The discussion that follows provides information that the Corps does have relevant to sediment transport, sedimentation, erosion and substrate characterization within our reservoirs.

The update of the ACT water control manual and plans focused on the operations of Corps reservoirs; therefore, it is most appropriate to focus on sediment transported by rivers rather than inputs from overland sources. However, comments are included where information was found that links land use change with an apparent effect on sediment loads. In general, the quantity and size of sediment transported by rivers is related to the size and frequency of dams in the river system. Impoundments behind dams serve as sediment traps where coarse bed material particles, typically sand and larger, settle in the lake headwaters where entering flows are slowed. Fine particles, typically silts and clays, can remain in suspension and pass through the lake downstream. Large impoundments typically trap most of the sediment load retaining all the sand and coarser particles plus much of the silt- and clay-sized particles. Smaller, run-of-the-river impoundments tend to pass all sizes of suspended particles during low to moderate flows and coarser bed material particles during high flows. The impact of the impoundments on river form is that the upstream channels can aggrade sediment and undergo an increase in bed elevation, thus reducing the channel gradient. Below a dam the river typically becomes starved for sediment. The channel downstream of a dam might or might not respond to the reduction in sediment load. The channel response depends on how resistant to erosion the channel bed and banks are and how quickly sediment is replenished from downstream tributaries and upland erosion sources. A typical response for channels, with bed and banks composed of easily eroded sands, silts, or soft clays, is for the bed to degrade to a reduced elevation; the channel might also widen through bank erosion.

The four largest impoundments in the system—Lake Martin, Lake Allatoona, Carters Lake, and R.L. Harris Lake—act as sediment traps, retaining most of the sand and larger bed material. Lake Martin accounts for 31 percent of the storage volume in the basin. Lake Allatoona is next largest, with 13 percent, followed by Carters Lake and R.L. Harris Lake, each with 8 percent. Shoaling in Lake Martin is not considered to be a problem because of the huge volume of storage available. A summary of the 2000 Lake Allatoona sedimentation study is included in Section 2.2.2.7.

2.2.1 Tailwater Degradation

Tailwater degradation is the lowering of the river bed elevation immediately downstream of a dam. Three factors drive the occurrence and rate of tailwater degradation: a ready supply of sediment from upstream, erodibility of the bed material, and sufficient flow energy to transport the bed material. After a dam's construction, a large portion of the sediment (as much as 90 percent for large reservoirs) often becomes trapped in the lake above the dam. Flow below the dam, having lost its sediment load to the lake, now has excess capacity to transport sediment. If the bed and bank materials below the dam are composed primarily of erodible sands, silts, and clays, tailwater degradation occurs until either the gradient of the river is sufficiently reduced to dissipate the flow energy, or the bed erodes to a more durable material such as bedrock. A cursory investigation of the tailwater degradation below the ACT projects was made using available data.

2.2.1.1 Claiborne Lake

On the ACT system, the most downstream dam is Claiborne. The tailwater reach extends approximately 72.5 mi downstream to the mouth of the Tombigbee River. Construction on the project began in May 1965 and was completed in September 1976. The slope of the river below the dam is approximately 0.06 ft/mi. The pool has little storage, and it is considered a run-of-the-river project.

Flow and gage measurements have been made below the dam since 1980. They were collected and analyzed to evaluate the degradation below the dam. The tailwater is tidally influenced, and there is a noticeable hysteresis effect in the tailwater rating curve. However, some trends are noticeable. The data were used, along with the rating curves applicable during the time of the measurements, to relate the observed gage heights and flows to a theoretical flow of 10,000 cfs (Figure 2.2-1).

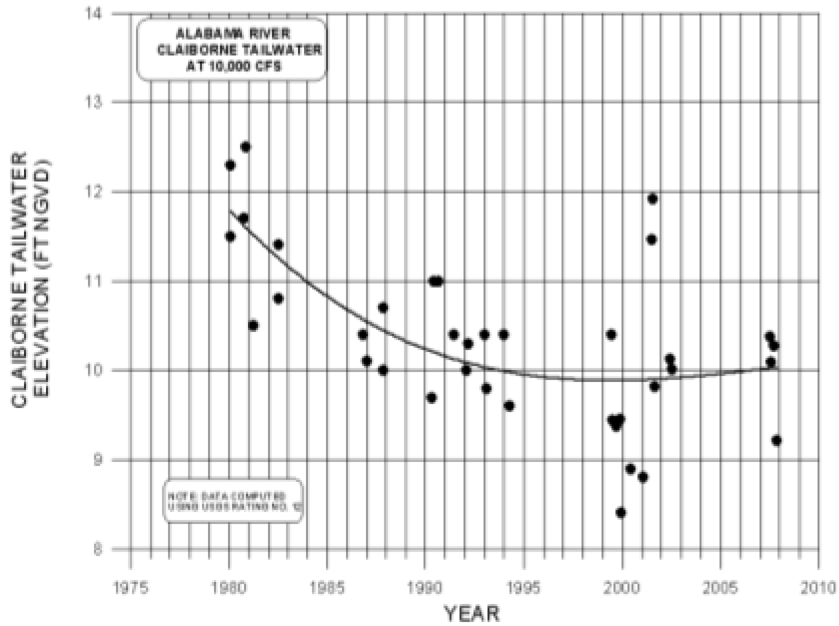


Figure 2.2-1 Claiborne Lake tailwater degradation.

A data gap exists between 1995 and 1999. In addition, the measurements after 2002 were all taken during extremely low flow and, thus, are less reliable because they are farther from the 10,000-cfs target. However, the data show a definite trend toward degradation from 1980 to 2000, perhaps caused by deepening and widening of the channel below the dam. From 2000 to 2007, the channel seems to be more stabilized. USGS has discontinued the rating curve at the site because of the variance in the gage caused by lockages, tides, and power generation at Millers Ferry Lock and Dam upstream.

2.2.1.2 Millers Ferry Lock and Dam and William “Bill” Dannelly Lake

Rating curve data are not available for Millers Ferry Lock and Dam tailwater.

2.2.1.3 Robert F. Henry Lock and Dam and R.E. “Bob” Woodruff Lake

Tailwater rating curve data are not available for Robert F. Henry Lock and Dam; however, historical sedimentation range surveys for the upper end of the Millers Ferry Lock and Dam pool (William “Bill” Dannelly Lake) were assessed for changes in the channel form. At range 30A, both widening and degredation have taken place since 1973 (Figure 2.2-2). However, the data show a drop in both widening and degredation rates since 1982. A trend plot of the sedimentation rates along the entire William “Bill” Dannelly Lake shows, for ranges 28A and 30A, bed degredation of about 0.5 ft per year from 1973 to 1982, and about 0.2 ft per year from 1980 to 1988 (Figure 2.2-3). For the next several ranges downstream from 28A, the bed has been at nearly a constant elevation. Data below range 20A indicate that the bed has been aggrading by several inches per year; thus, the scour is limited to the reach immediately below Robert F. Henry Lock and Dam.

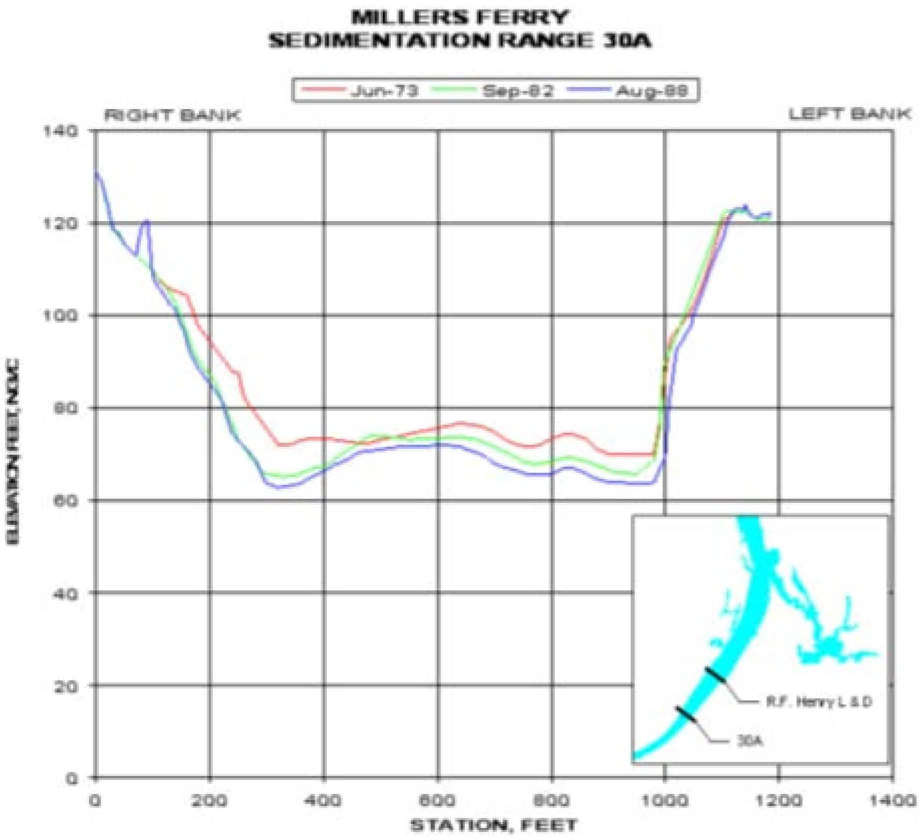


Figure 2.2-2 Tailwater degradation below Robert F. Henry Lock and Dam.

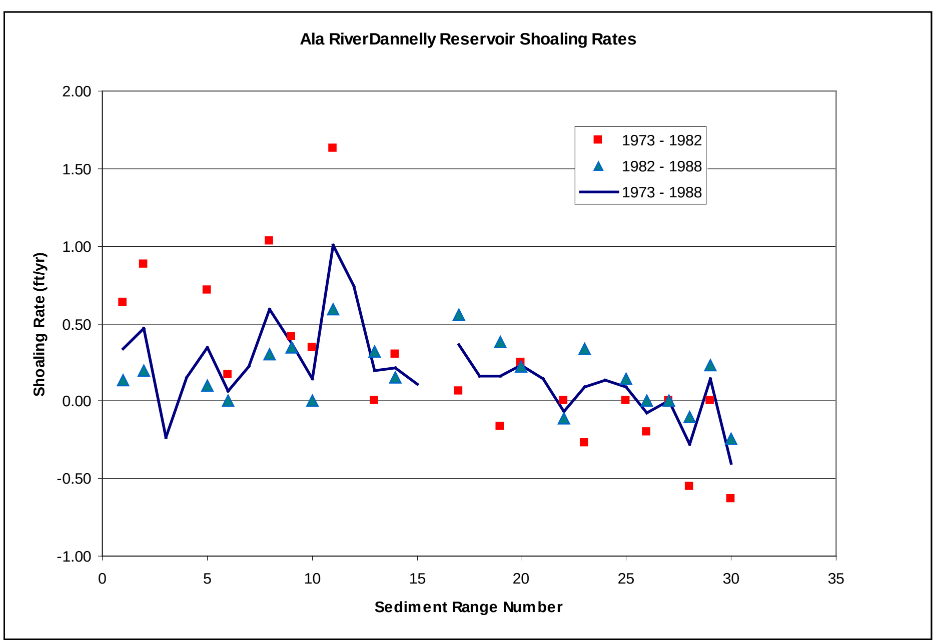


Figure 2.2-3 Shoaling rates for Millers Ferry Lock and Dam Pool, William "Bill" Dannelly Lake.

2.2.1.4 Logan Martin Lake

This APC dam was the second dam built as a part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1960, and operation began in 1964. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-4).

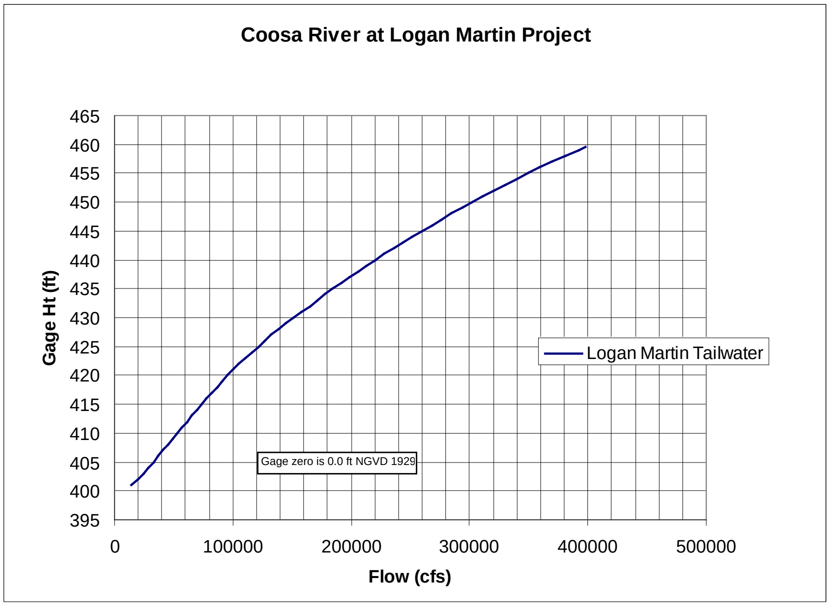


Figure 2.2-4 Logan Martin Lake tailwater rating curve.

2.2.1.5 H. Neely Henry Dam

This APC dam was part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1962, and operation began in 1966. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-5).

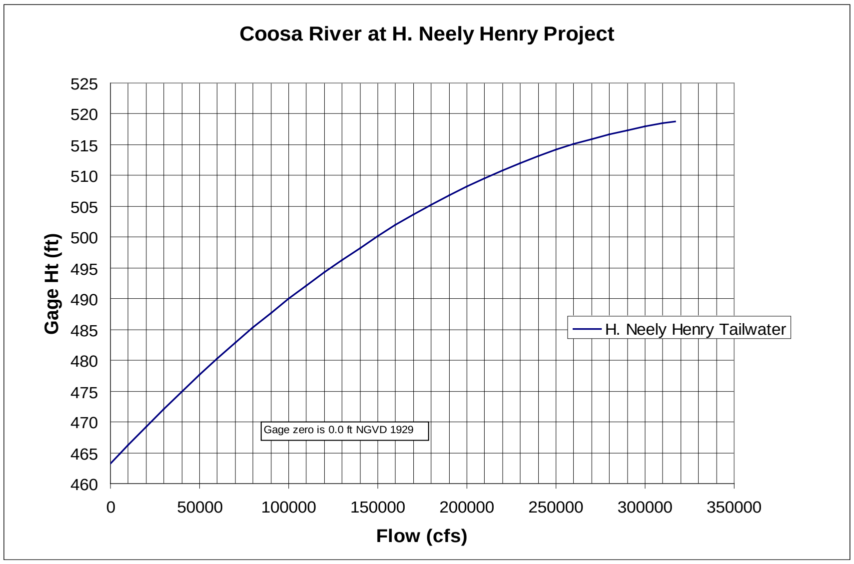


Figure 2.2-5 H. Neely Henry Dam tailwater rating curve.

2.2.1.6 Weiss Lake

This APC dam was part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1958, and operation began in 1961. There is a tailwater rating curve at both the power house and the spillway locations (Figure 2.2-6). No observable change has occurred in either of the tailwater rating curves developed for the project.

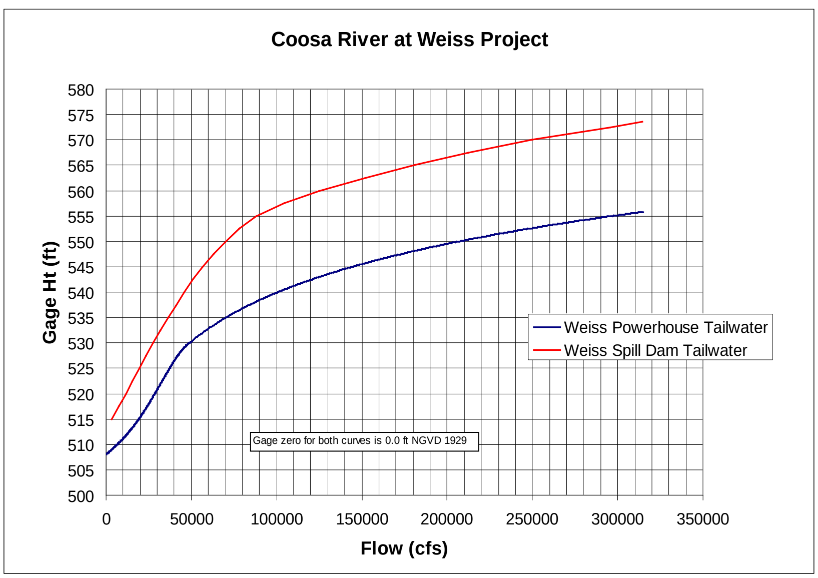


Figure 2.2-6 Weiss Lake tailwater rating curves.

2.2.1.7 R.L. Harris Lake

Construction began for this newest project on the Tallapoosa River in 1974, and operation began in 1983. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-7).

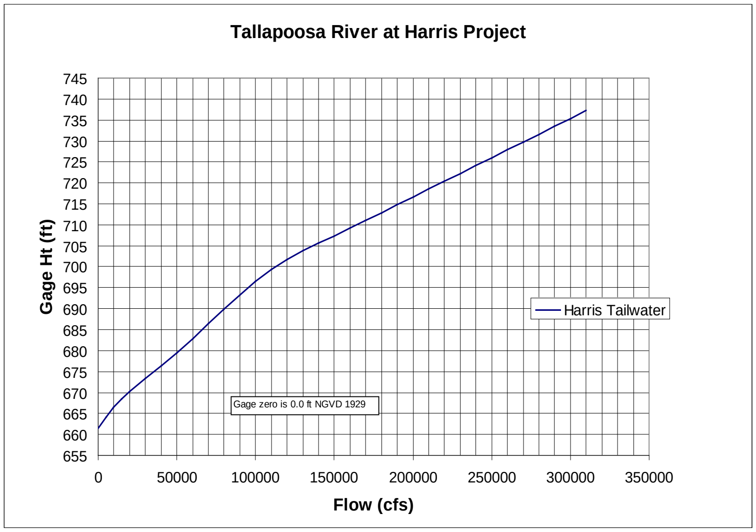


Figure 2.2-7 R.L. Harris Lake tailwater rating curve.

2.2.1.8 Carters Lake

Construction on Carters Lake was started in 1962 and completed in 1977. The USGS gage 0238500, (Coosawattee River at Carters) is at U.S. Hwy 411, just downstream of the Carters Reregulation Dam. Historic rating curve data extending from 1978 to 2008 at this gage were obtained from the USGS. The curves were plotted to determine the degree of movement in the curve over time (Figure 2.2-8).

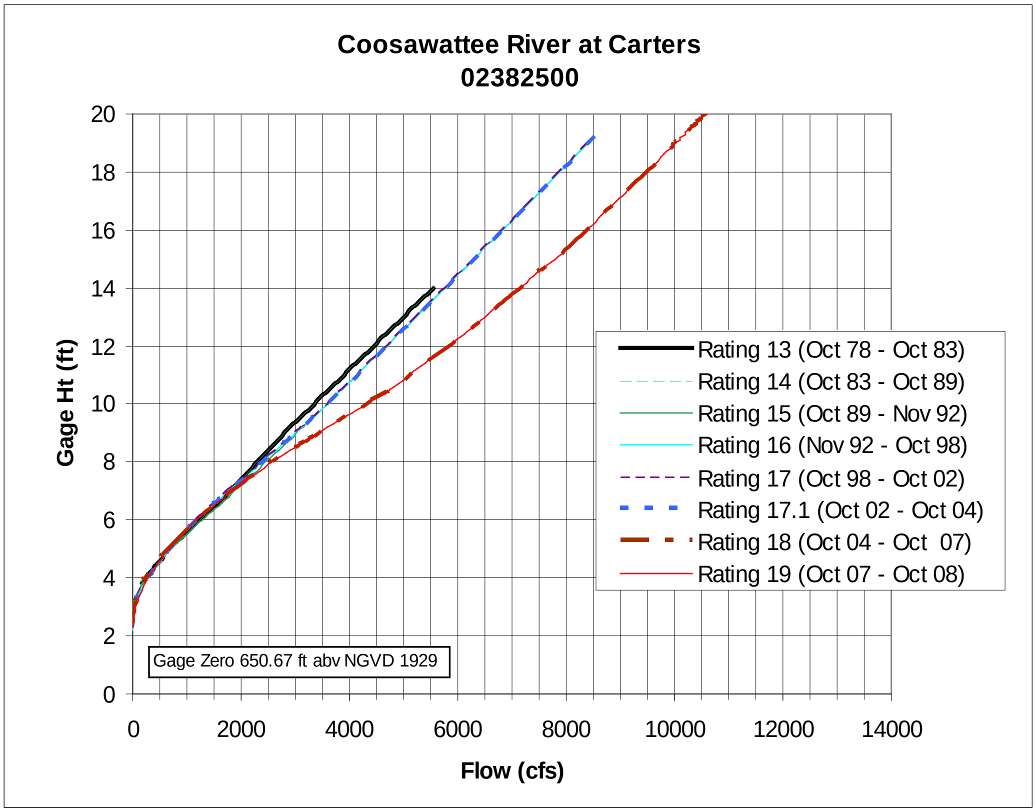


Figure 2.2-8 Carters Lake historic tailwater rating curves.

The curves show an obvious lowering of the tailwater of approximately 2–2.5 ft at flows above 3,000 cfs. However, the low flows do not appear to have been affected (Figure 2.2-9).

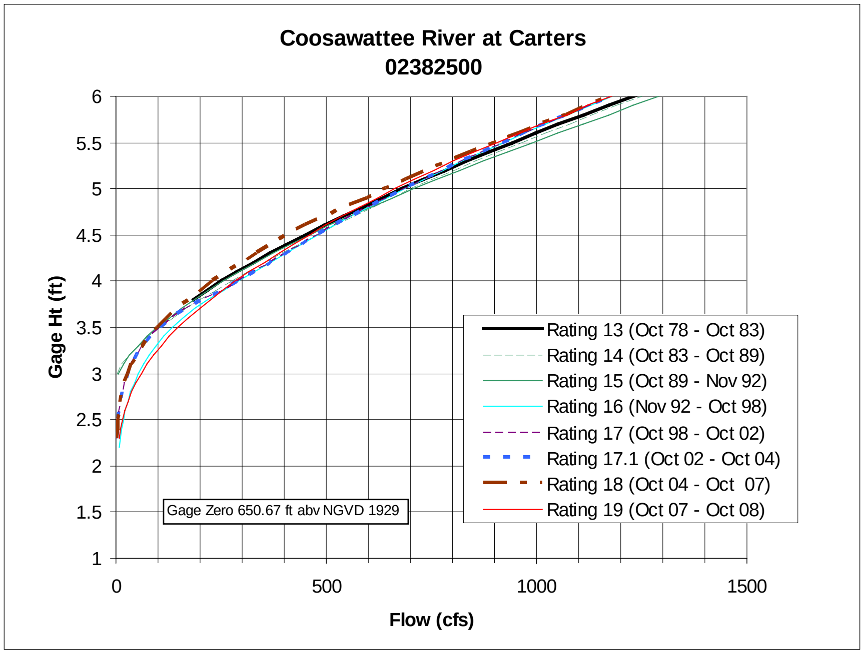


Figure 2.2-9 Carters Lake low-flow tailwater rating curves.

The lower part of the curve indicates that the channel has not degraded over time. The change in the upper part of the curve might have been because of the lack of high-flow data during the early years, and as more storms were observed, that part of the curve was well defined. Another possibility is that overbank clearing downstream might have occurred, or modifications to Hwy 411. The significant point is that the channel does not appear to have degraded. The presence of rock in the channel offers a reasonable and probable explanation for the lack of degradation.

2.2.1.9 Lake Allatoona

Construction on the dam was completed in 1950. The USGS gage 0239400, (Etowah River at Lake Allatoona, above Cartersville, Georgia) is 0.8 mi downstream from Lake Allatoona. Historic rating curve data extending from 1979 to 2008 at this gage were obtained from the USGS. The curves were plotted to determine the degree of movement in the curve over time (Figure 2.2-10). The curves show little difference over the period of record. The lower part of the curve shows no degradation over the 1979–2008 period, but degradation might have occurred during construction of the dam (Figure 2.2-11).

2.2.2 Impact of Existing Operations on River Channel Stability

A specific gage analysis was conducted at several USGS stream gaging stations in the basin to better understand the impact of dam operations on the stability of the rivers.

A cursory investigation of the condition of the pools was made to see if shoaling is a significant issue. Historic sediment ranges were evaluated where possible and other available data were used to estimate the appropriateness of using the existing area-capacity relationships in the modeling efforts.

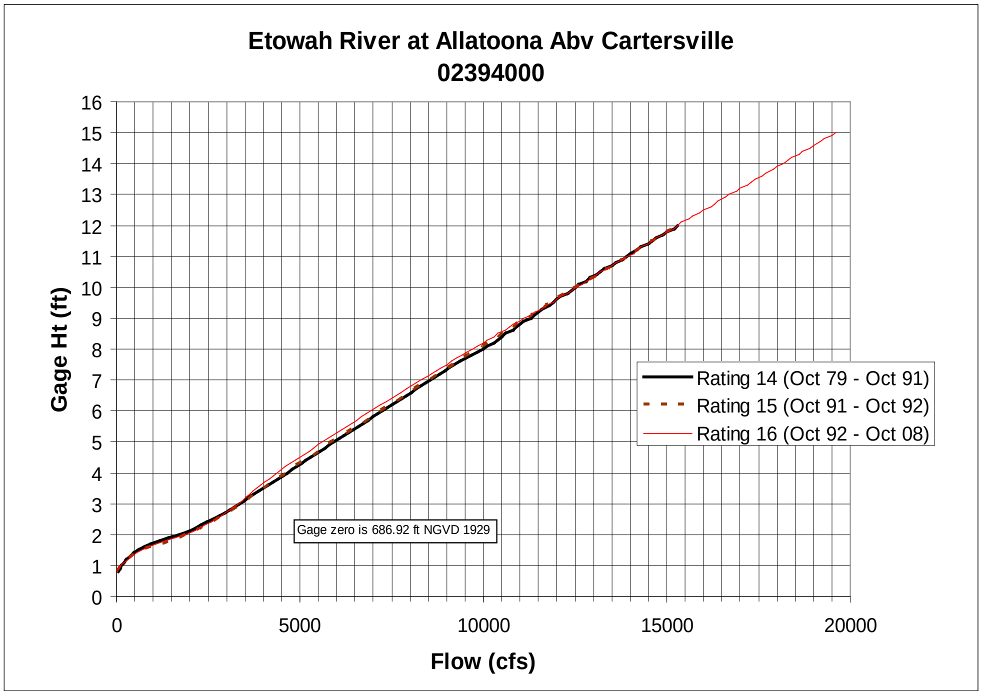


Figure 2.2-10 Lake Allatoona tailwater rating curve.

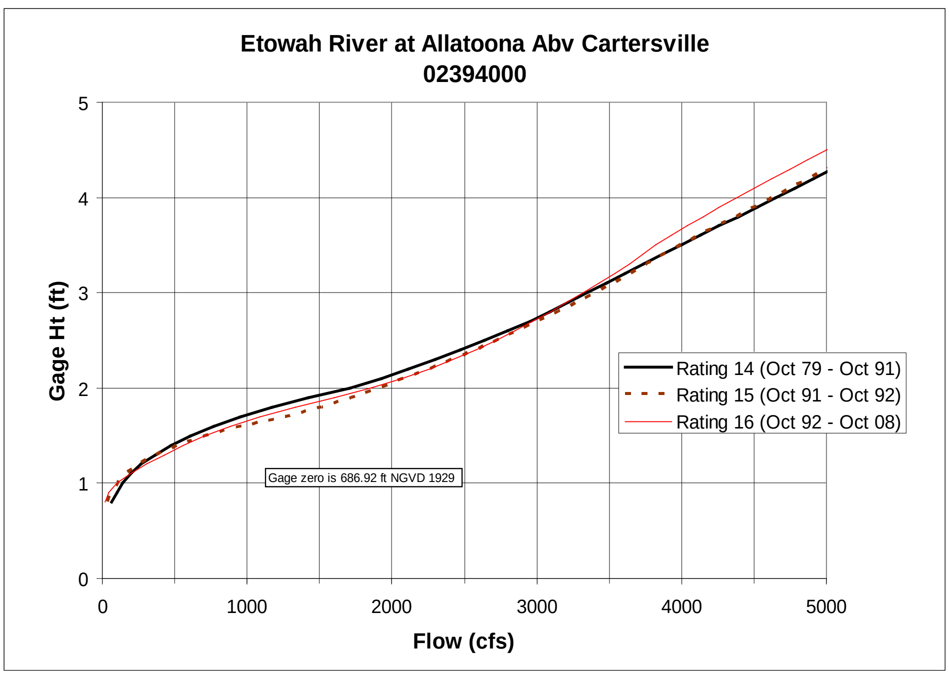


Figure 2.2-11 Lake Allatoona tailwater rating curve.

2.2.2.1 Claiborne Lake

Storage volume of the lake is listed at 96,360 ac-ft at elevation 35 ft. Sediment range surveys of the Claiborne Lake were made initially in 1982 and updated again in 2009. However, the pool has a relatively small amount of storage, and it is a run-of-the-river project. Operation of the project is not affected by the storage lost to shoaling in the lake, and it is reasonable to assume that the existing area/capacity curve is adequate to use in modeling the system and to include in the present WCM update.

A table of the shoaling locations and total dredging amounts since 1981 is shown below (Table 2.2-1). The data show that the location of the greatest dredging/shoaling is at the Millers Ferry Lock and Dam lower approach at RM 133, although the frequency of dredging is greatest at the Claiborne Lake upper approach, with consecutive periods between dredging events of 2, 6, 5, and 12 years since 1985.

2.2.2.2 Millers Ferry Lock and Dam and William “Bill” Dannelly Lake

Storage volume of the lake is listed at 346,250 ac-ft at elevation 80.8 ft. Surveys of the 30 sediment ranges in William “Bill” Dannelly Lake were made initially in 1973, 1982, and again in 1988 (Figure 2.2-12). The surveys were repeated in 2009.

The sections show some shoaling in the lower part of the reservoir between 1973 and 1982, at a reduced rate between 1982 and 1988. All 30 ranges were compared using approximate methods on the basis of the channel elevation change for the two periods. Data were not available for all the sections in the 1982 survey, but rates were computed for all the available data (Figure 2.2-12).

Table 2.2-1
Claiborne Lake dredging 1981–2007

Mile	Bar name	Period	Dredged	Cubic yards
72.5	Claiborne Lock	05/28/85–05/31/85	34+45 to 41+95	8,706
	Upper Approach	05/24/87–05/26/87	NA	12,044
		07/22/93–07/23/93	0+00 to 4+50	9,451*
		06/05/95–06/06/95	66+50 to 64+00	8,730*
		10/15/07–10/16/07	2+06 to 7+37	8,120
107.9	Wilcox (Bar 107)	10/07/92–10/10/92	22+00 to 36+40	24,313
		09/21/97–09/25/97	44+83 to 30+60	28,263
		10/19/07–10/20/07	32+17 to 43+78	4,237
117.5	Holly Ferry	10/05/92–10/07/92	5+00 to 15+00	15,977
122.7	Walnut Bluff	09/25/92–10/05/92	1+00 to 14+50	38,529
		10/20/07–10/23/07	3+28 to 14+28	25,076
133.0	Millers Ferry Lock and Dam	08/15/90–08/25/90	21+10 to 24+60	86,710
	Lower Approach		33+90 to 55+23	
		08/17/92–08/23/92	22+00 to 25+00	1,242
		10/23/07–10/23/07	54+00 to 55+59	735

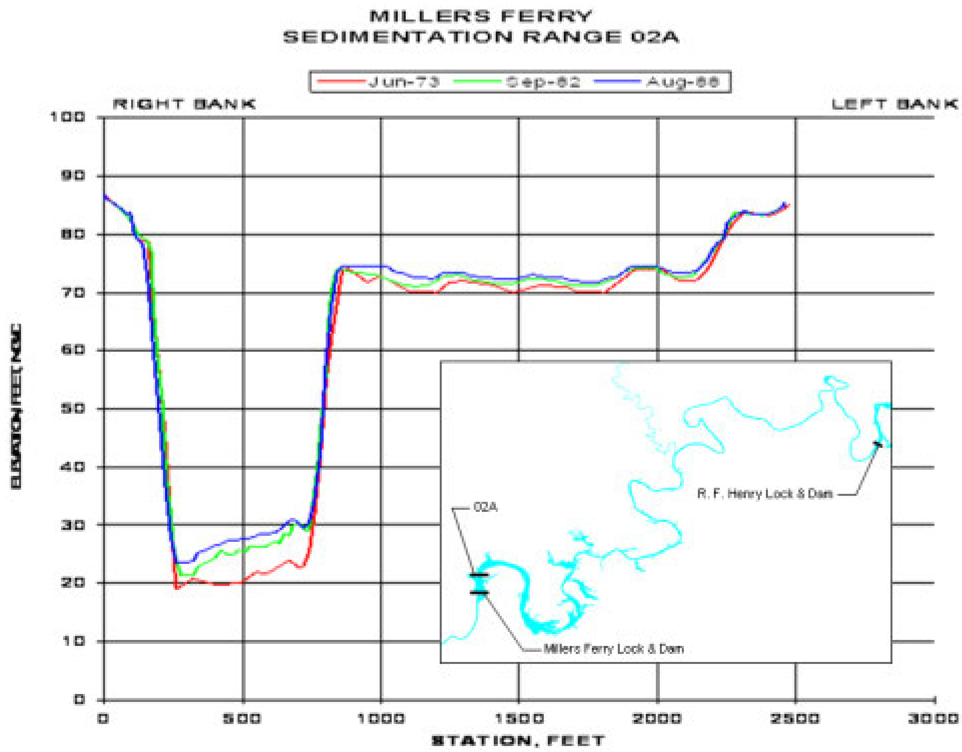


Figure 2.2-12 Cross section of Millers Ferry Lock and Dam Pool, William "Bill" Dannelly Lake, sedimentation range 02A.

For the 1973 to the 1982 period, shoaling and scour rate were the greatest, ranging from shoaling 1.6 ft/yr near Range 11, in the lower part of the lake to scouring 0.6 ft/yr at range 30 just below Robert F. Henry Lock and Dam. The 1982–1988 period shows that some shoaling occurred during that period over much of the lake with only minor scour in the upper lake reach. The overall trend from 1973 to 1988 indicates that, in general, scour has taken place immediately below Robert F. Henry Lock and Dam at range 30 downstream to about range 26. Sediment deposition has taken place from range 25 downstream to range 01, immediately above Millers Ferry Lock and Dam, at a rate of about 0.1 ft to 1.0 ft per year.

Geographic information system (GIS) data for the channel above Millers Ferry Lock and Dam were obtained in February 2009. The data can be used to develop a new area/capacity curve but would require additional hydrographic surveys to extend the limits to the top of banks. An update of the area/capacity curve would be helpful, but using the present curve for the present modeling effort is not unreasonable.

2.2.2.3 Robert F. Henry Lock and Dam and R.E. "Bob" Woodruff Lake

Storage volume of the lake is listed at 234,200 ac-ft at elevation 125 ft. Surveys of the R.E. "Bob" Woodruff Lake were made initially in 1974. The surveys were repeated in 1982 and 1988. They were re-surveyed again in 2009. Throughout the entire pool from 1974 to 1988, minor amounts of both shoaling and bank erosion occurred with the highest rates occurring between 1974 and 1982. The shoaling and bank erosion shown in Figure 2.2-13 is representative for all the sedimentation ranges in the pool.

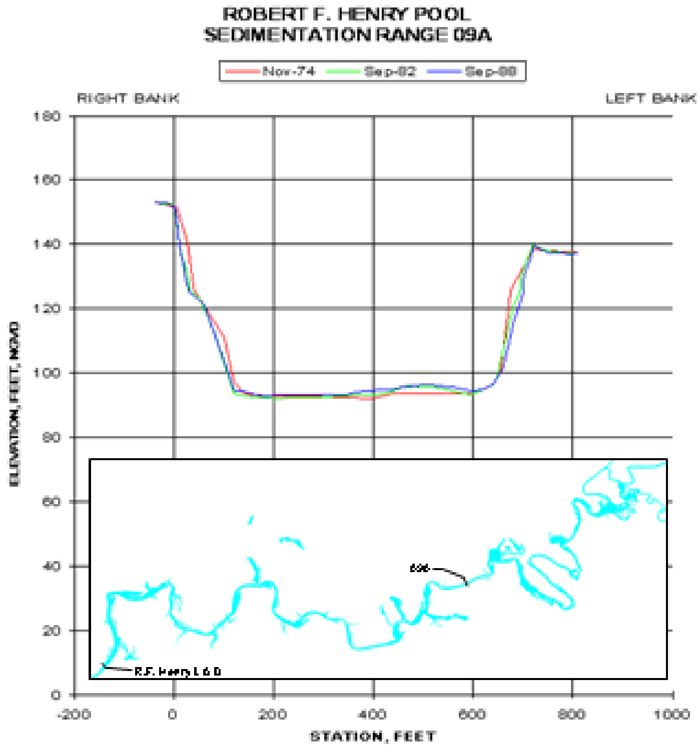


Figure 2.2-13 Cross section of Robert F. Henry Lock and Dam and R.E. "Bob" Woodruff Lake, sedimentation range 09A.

The sedimentation range surveys indicate that the overall change in storage is small, thus operation of the project would not be affected by the shoaling shown in the lake, and it is reasonable to assume that the existing area/capacity curve is adequate to use in modeling of the system and to include in the present WCM update.

2.2.2.4 Logan Martin Lake

Logan Martin Lake is in the Alabama counties of Calhoun, St. Clair, and Talladega. The lake has a surface area of 15,263 ac and 275 mi of shoreline at a normal pool elevation of 465 ft. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the National Agricultural Statistics Service (NASS) Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the percent change in erosion from 1970 to 2001 was derived (Table 2.2-2). The impact of the erosion on the Area/Capacity relationship has not been determined.

Table 2.2-2
Erosion 1970–1982 for counties in the ACT Basin

County	Year	Acres cultivated	% Change	Erosion rate	Tons soil eroded	% Change
Calhoun	1970	14,210		7.2	102,312	
	2001	5,518	–61.2%	6.0	33,108	–67.6%
Cherokee	1970	40,080		7.2	288,576	
	2001	32,518	–18.9%	6.0	195,108	–32.4%
Etowah	1970	20,200		7.2	145,440	
	2001	6,018	–70.2%	6.0	36,108	–75.2%
St. Clair	1970	4,810		7.2	34,632	
	2001	18	–99.6%	6.0	108	–99.7%
Talladega	1970	28,250		7.2	203,400	
	2001	18,318	–35.2%	6.0	109,908	–45.96%

2.2.2.5 H. Neely Henry Lake

H. Neely Henry Lake is in the Alabama counties of Calhoun, Cherokee, Etowah, and St. Clair. H. Neely Henry Lake has a surface area of 11,235 ac and 339 mi of shoreline at a normal pool elevation of 508 ft. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the NASS Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the changes shown in Table 2.2-2, for H. Neely Henry Lake are applicable.

2.2.2.6 Weiss Lake

Weiss Lake is in Cherokee County, Alabama (population 23,988, year 2000) and Floyd County, Georgia (population 90,565, year 2000). The surface area of the reservoir at a normal pool elevation of 564 ft is approximately 30,200 ac with approximately 447 mi of shoreline. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the NASS Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the changes shown in Table 2.2-2, for Weiss Lake are applicable.

2.2.2.7 Lake Allatoona

A cursory screening of the need for additional sedimentation range surveys to re-compute the area-capacity curve and of the shoaling tendencies of Lake Allatoona was made in the year 2000 (USACE, Mobile District 2000). That study was deemed adequate to determine the need for further re-survey of sediment ranges or reestablishing the area/capacity curve.

Analysis of the data revealed that sedimentation and scour had occurred in varying amounts throughout the lake. Overall, the analysis revealed consistently light or no sedimentation in the main body of the lake. Most of the high sedimentation occurred in the outermost reaches of the lake. The reaches are primarily high-inflow locations such as stormwater system outlets and at the mouths of tributary streams. As a result, increased sedimentation is most likely occurring on two levels: (1) sediment loads being carried into the lake with the tributary and outlet flows, and (2) increased flow velocities in those areas are actually eroding the channels and depositing the resulting sediment further downstream.

The level of increased sedimentation in the outermost reaches is not surprising because the area surrounding the lake has experienced dramatic development in recent years. Much of the development can be seen in Cobb County, especially along the I-75 corridor, and in Cherokee County between I-75 and I-575. The region has matured into a major part of suburban Atlanta, bringing with it extensive residential and commercial infrastructure.

The study indicates that the shoreline of Lake Allatoona seems to have experienced relatively little sedimentation or scour in the years since its construction. The shoreline appears to be consistent throughout each of the survey data set.

On the basis of the year 2000 study, it is reasonable to assume that the existing area/capacity curve is adequate for ResSim modeling and for continued use in the Lake Allatoona WCM.

2.2.2.8 Carters Lake

Storage volume of Carters Lake is listed at 242,200 ac-ft for inactive storage, 134,900 ac-ft for power storage, and 95,700 ac-ft for flood storage, for a total storage of 472,800 ac-ft at the top of the flood-control pool elevation of 1,099 ft. No post-construction surveys of the pool have been made since the pool was filled because the pool is 300–400 ft deep near the dam, and until recently, surveying equipment adequate to reach these depths was not available. Surveys were conducted in 2009. Modern equipment now exists to adequately survey at the depths required at Carters Lake. The surveys should be obtained and analyzed to decide if an update of the area/capacity curve would be warranted.

2.2.2.9 R.L. Harris Lake

R.L. Harris Lake is in the Alabama counties of Randolph and Clay. The lake has a surface area of 10,661 ac at a normal summer pool elevation of 793 ft. Construction was completed in 1983, and no sedimentation studies have been done on R.L. Harris Lake. However, because of the relatively recent completion date and other erosion/sedimentation data developed for other locations, it is reasonable to assume that the existing area/capacity relationship would be adequate for modeling purposes.

2.3 Aquatic organism passage at dams, particularly in the upstream direction.

Use of locks to aid in fish passage are currently being implemented and evaluated in cooperation with the Service, the Nature Conservancy, Auburn University and others. Other studies to define target species and investigate the feasibility of providing passage at select facilities are important, but beyond the scope of the current effort.

2.4 Temperature effects on species of concern from reservoirs and hydroelectric operations.

No studies were conducted for the DEIS for the WCM update. As new information becomes available adaptive management will be implemented. Water temperature changes that would be expected were described in Section 2.2. The effects of these potential changes on aquatic biota are further evaluated and presented in section 6.5 of the PDEIS.

2.5 Minimum flows available for Weiss bypass channel.

The USACE does not have control over the Weiss Bypass Channel. The minimum flows during the summer at this location should be discussed with FERC.

2.6 Conservation and recovery of natural flow variability, and reduction of effects of hydropower peaking flows on species of concern.

A return to "natural" (pre-dam) flow variability is not attainable or desirable given other Congressionally authorized purposes of hydropower, flood control, and recreation. The need for seasonal minimum flows is addressed at Carters via a minimum monthly flow release target from the re-regulation pool as part of the Proposed Action. At Lake Allatoona, where there is no re-regulation pool, implementation of a non-hydropower peaking operation for a natural flow regime would require a shutdown of hydropower production at the facility for a specified period of time. This would necessarily occur since there is no possible gradation of water releases between the "off" (0 cfs) and "on" (~3500 cfs) conditions per main hydropower unit. Such a shutdown is not considered practicable given that hydropower production is an important component of the regional power grid.

2.7 Maintenance of floodplain connectivity to flood pulses.

Studies are not currently available to address this question because there is no Lidar in non-reservoir sections of the Basin. USACE can provide stage and flow data but does not know what flows may be required.

Dedicated studies evaluating the effects of management actions on floodplain connectivity are not currently available. However, section 6.5.1 of the PDEIS will review the implications of the proposed management actions for the WCM update. USACE can provide stage and discharge data, but a comprehensive geomorphological assessment is necessary to determine the extent of flood pulses necessary to establish connectivity.

2.8 Potential for reintroductions, enhancements of listed species populations in the basin.

Reintroduction of species and enhancement of habitat for Federally listed species is beyond the scope of the current Water Control Manual update. Surveys for species and habitat for the proposed action have been coordinated with the Service and have been recently completed.

In 2010, the Corps sponsored a survey of mussel species in selected reaches of the Coosa River drainage in Georgia (Dinkins and Hughes 2011), representing the most comprehensive study of T&E mussels in the basin since Williams and Hughes (1998). The Corps has worked closely with the FWS and APC during the development of the updated WCM to ensure both stakeholders concerns are addressed. We will continue this high level of communication and collaboration as opportunities for adaptive management and further study arise.

Dinkins, G and M. H. Hughes. 2011. Freshwater mussels (Unionidae) and aquatic snails of selected reaches of the Coosa River drainage, Georgia. Dinkins Biological Consulting, Powell, TN. January 2011.

Williams, J. D., and M. H. Hughes. 1998. Freshwater mussels (Unionidae) of selected reaches of the main channel rivers in the Coosa drainage of Georgia. U.S. Geological Survey, Florida, Caribbean Science Center, Gainesville, Florida. October 1998.

2.9 Restoration and maintenance of healthy water quality parameters for all life stages of aquatic species under a variety of flow conditions.

Species specific habitat and water quality requirements are lacking for many aquatic organisms inhabiting the ACT basin. Even fewer data are available to describe ontogenic shifts with respect to these environmental parameters. As such, dedicated studies of key species, including T&E or recreationally important species, should be undertaken to address this data need; however, the level of effort needed to accomplish this is beyond the intent of the current work.

As illustrated in Figure 2.2-15 and described in section 2.2, a large percentage of mainstem reaches in the ACT Basin meet current water quality standards. Section 6.5.3 of the DEIS will review the proposed management alternatives and the implications of water quality changes on aquatic biota. As previously stated, the Corps will continue to work closely with stakeholders in adaptive management and seek opportunities for further study.

2.10 Development of adaptive management protocols that include goals, objectives, research, and monitoring to allow greater understanding of riverine ecosystem response to complex variables.

Although we are not opposed to adaptive management to achieve specific objectives, when possible, the development of research and monitoring efforts goes beyond the stated scope of the current water control manual update, and therefore cannot be addressed in the DEIS.

Draft Fish and Wildlife Coordination Act Report

On

Water Control Manual Updates for the Alabama – Coosa – Tallapoosa River Basin in Alabama and Georgia

Prepared by:
Alabama Ecological Services Field Office
Daphne, Alabama

And

Georgia Ecological Services Field Office
Athens, Georgia

And

Southeast Regional Office
Atlanta, Georgia

U.S. Fish and Wildlife Service
Southeast Region
Daphne, Alabama
December 2012

United States Department of the Interior

FISH AND WILDLIFE SERVICE
1208-B Main Street
Daphne, Alabama 36526

IN REPLY REFER TO:

DEC 2 1 2012

Colonel Steven J. Roemhildt
U.S. Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Roemhildt:

We are providing your agency with a Draft Fish and Wildlife Coordination Act Report (DFWCAR) for the proposed Water Control Manual (WCM) updates for the Alabama-Coosa-Tallapoosa (ACT) River Basin in Georgia and Alabama in partial fulfillment of Section 2(b) of the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*). The purpose of the WCM updates is to identify operating criteria and guidelines for managing water storage and release of water from U.S. Army Corps of Engineers (Corps) reservoirs. We submit the following comments and recommendations under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq.*), the Migratory Bird Treaty Act (MBTA) (49 Stat. 755, as amended; 16 U.S.C. § 702 *et seq.*), and the FWCA. We anticipate providing comments on the draft Environmental Impact Statement (DEIS) that the Corps is preparing to support its decision regarding the WCM update, and it is our understanding that the Corps intends to include this DFWCAR as an appendix to the DEIS. Delivery of the final version of this report will depend upon the Corps' schedule. A separate consultation will occur regarding the potential impacts of the Corps' proposal on federally-listed species protected under the ESA.

The DFWCAR outlines the fish and wildlife concerns and planning objectives that were provided in our May 3, 2010, Planning Aid Letter (PAL) and August 13, 2010, PAL supplement to you, along with our understanding of the Corps' responses to our concerns and objectives. The DFWCAR describes the alternatives and evaluates the anticipated impacts of the selected plan. Because of the limited scope of the WCM update, the proposed alternative does not fully address many of the Service's conservation concerns in the basin. However, our report provides the Corps with fish and wildlife conservation measures and recommendations. We urge the Corps to consider additional alternatives for analysis that would address our concerns about water quality in project tailraces, alterations of flow regimes that adversely affect fish and wildlife, etc., and could lead to formulation of an environmentally preferable alternative in the Corps' decision-making process for the operations of the ACT reservoirs.

A version of the DFWCAR was distributed to Alabama Department of Conservation and Natural Resources, Alabama Office of Water Resources, Georgia Department of Natural Resources-Wildlife Resources Division, and National Ocean Atmospheric Administration.

If you have any questions, please contact Alabama Ecological Services staff biologist Jennifer Pritchett (251) 441-6633 or Deputy Field Supervisor Dan Everson (251) 441-5837, Georgia Ecological Services staff biologists Alice Lawrence or Will Duncan at (706) 613-9493, or Southeast Regional Office staff biologist Jerry Ziewitz at (850) 877-6513.

Sincerely,

William J. Pearson
Field Supervisor
Alabama Ecological Services Field Office

EXECUTIVE SUMMARY

In November 2007, the Secretary of the Army directed the U.S. Army Corps of Engineers (Corps) to develop and update Water Control Manuals (WCMs) for the Alabama-Coosa-Tallapoosa (ACT) River Basin. The purpose of the WCM updates is to identify operating criteria and guidelines for managing water storage and release of water from Corps reservoirs. This DFWCAR outlines the U.S. Fish and Wildlife Service's (Service's) fish and wildlife concerns and planning objectives that were previously provided to the Corps in a Planning Aid Letter (PAL), along with our current understanding of the Corps' position on each PAL recommendation. The DFWCAR also describes the alternatives and evaluates the anticipated project impacts of the selected plan.

The Corps' Proposed Action Alternative would continue to operate federal projects in the ACT Basin in a balanced manner to achieve all authorized project purposes. Operations under the Proposed Action Alternative include a minimum flow of 240 cubic feet per second (cfs) at Lake Allatoona and a phased fall drawdown period from early September through December with four action zones that would mimic seasonal demands. Modifications to the hydropower schedule would allow greater operational flexibility to meet power demands while conserving storage, and generation would be reduced during annual drawdown in the fall (September-October). Storage in Lake Allatoona would be 6,371 acre feet (ac-ft) and 13,140 ac-ft for the Cobb County-Marietta Watershed Authority (CCMWA). Carters Lake would provide a minimum flow of 240 cfs and refined operations that would include two action zones to manage downstream releases. When Carters Lake is in Zone 1 Carters Reregulation Dam minimum flow releases would be equal to the seasonal minimum flow based on mean monthly flow upstream of Carters Lake and storage for water supply for the City of Chatsworth would be 818 ac-ft.

Fish spawning operations on Lake Allatoona would continue as outlined in District Regulation (DR) 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft Standing Operating Procedure (SOP) *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005). Lake levels would be adequately maintained for successful fish spawning.

The Proposed Action Alternative would implement a revised Alabama Drought Response Operations Proposal (ADROP) including zones 1, 2, and 3 of drought operation triggers with recommendations by the Service. The plan is composed of three parts: reduced hydropower generation as pool levels decline in the headwaters at Lake Allatoona and Carters Lake in Georgia, operations at Alabama Power Company (APC) projects on the Coosa and Tallapoosa Rivers based on Drought Intensity Levels (DILs) driven by defined drought triggers, and flow from downstream operations at Corps projects below Montgomery would reduce due to the 7Q10 levels from upstream APC projects.

Seasonal navigation releases (Alabama River 9.0-ft or 7.5-ft channel depth) and maintenance dredging would be provided. If sufficient flows cannot support a navigation channel of 7.5-ft, navigation would be suspended and flows at Montgomery would be reduced to 4,640 cfs or lower if one or more of the drought operation triggers would be exceeded. Navigation operations would be driven by DILs: when equal to zero navigation will commence, but if the DIL is greater than zero navigation will be suspended.

At this time, the Service does not fully support the Corps' Proposed Action Alternative as currently described nor the Corps' No Action Alternative. Because of the limited scope of the WCM update, the proposed alternative cannot fully address many of the Service's conservation concerns in the basin. Our position is due to the lack of improvement to water quality, lack of support for reintroduction and enhancements for listed species, minimal mimicking of components of the natural flow regime, no reduction of effects of hydropower peaking flows, and no recognition that fish passage at ACT dams is within the scope of the current effort. On the other hand, the Service fully supports the ADROP. The Service also supports the suspension of navigation while drought conditions are met, and the ongoing efforts of the Corps in organism passage through locks and dams, but encourages additional studies at upstream facilities.

In this DFWCAR the Service has provided the Corps with conservation measures to improve the management of their dams and reservoirs in the ACT Basin. The Service has suggested methods to improve water quality, attain a more natural flow regime, increase connection to floodplain environments, and ways to reintroduce and provide enhancements for species federally-listed under the Endangered Species Act (ESA). The intent of these evaluations and analyses is to inform the development of alternatives and to address the impacts of the Proposed Action Alternative.

TABLE OF CONTENTS

INTRODUCTION

Purpose, Scope & Authority

In November 2007, the Secretary of the Army directed the Corps to develop updated WCMs for the ACT River Basin. The following is taken from the Corps' response to the Service's PAL (Corps 2011):

"The Corps proposes to prepare an updated master Water Control Manual (WCM or Master Manual) for the Alabama, Coosa, and Tallapoosa Rivers (ACT) Basin. The component parts of the master WCM would be nine project-level WCMs, presented as appendices. Only two of the four Alabama Power Company (APC) projects in the basin with Corps WCMs will be included in this WCM update. Additional studies would be required for Logan Martin Lake and Weiss Lake to address flood damage reduction prior to updating the manuals at those facilities. The Corps and APC will develop and execute separate Memoranda of Understanding that address only navigation and drought operations for Logan Martin and Weiss Lakes. Operations at those projects will be incorporated in the Master Manual Update.

WCMs contain drought plans and action zones to assist the Corps in knowing when to reduce or increase reservoir releases and conserve storage in the Corps reservoirs. The individual manuals typically outline the regulation schedules for each project, including operation criteria, guidelines, and guide curves, and specifications for storage and releases from the reservoirs. The WCMs also outline the coordination protocol and data collection, management and dissemination associated with routine and specific water management activities (such as flood-control operations or drought contingency operations). Operational flexibility and discretion are necessary to balance the water management needs for the numerous (and often competing) authorized project purposes at each individual project. In addition, there is a need to balance basin-wide water resource needs. Project operations also must be able to adapt to seasonal and yearly variations in flow and climatic conditions."

The Service's involvement in this project is authorized by the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.) (FWCA). The FWCA establishes fish and wildlife conservation as a co-equal purpose or objective of federally-funded or permitted water resource development proposals or projects. This DFWCAR constitutes the report of the Secretary of the Interior as required by Section 2(b) of the FWCA.

FWCA Agency Coordination

A copy of the draft report has been sent to the Alabama Department of Conservation and Natural Resources (ADCNR), Alabama Office of Water Resources (OWR), Georgia Department of Natural Resources, and the National Oceanic Atmospheric Administration (NOAA. We have received comments from OWR and are awaiting comments from the other parties.

Prior Studies and Reports

- Corps' Federal Register Notice of Intent, November 9, 2007, Intent To Prepare Draft Environmental Impact Statement for Revised Water Control Manuals for the Alabama-Coosa-Tallapoosa River Basin. Vol. 72, No. 217 (Appendix I);
- Service's October 20, 2008, Scoping Letter to the Corps (Appendix II);
- Service's May 3, 2010, PAL to the Corps (Appendix III);
- Service's August 13, 2010, Supplement to PAL to the Corps (Appendix IV);
- Corps' June 6, 2011, response to the Service's PAL (Appendix V); and
- Corps' November 22, 2011, response to the Service's questions regarding the Corps' June 6, 2011 document (Appendix VI).

FISH AND WILDLIFE CONCERNS AND PLANNING OBJECTIVES

The PAL (Service 2010) regarding the ACT WCM Updates stated the primary concerns and planning objectives for species and ecosystem integrity in the ACT. Influences such as human development, including the construction and operation of dams, channelization, dredging, and water quality degradation (Service 2000, Atkins et al. 2004, Service 2006) remain threats to the ACT. Planning objectives to improve the quality of the ACT focus on instream flow, water quality, habitat protection, and fish passage. Enhancements in these areas should be a priority in future Corps operations. Monitoring and adaptive management are strongly recommended in order to improve the ACT ecosystem, as the Service believes that the WCM updates are an opportunity to address several outstanding issues and water management concerns within the ACT basin.

PROJECT AREA

Totaling 22,719 square miles (mi^2), the ACT Basin falls within the Blue Ridge, Ridge & Valley, Piedmont, and Coastal Plain physiographic provinces, originating in Georgia and ending in Alabama. In northwest Georgia the basin's headwater rivers - Conasauga, Coosawattee, Oostanaula, Etowah, Coosa and Tallapoosa Rivers - flow in a southwest direction toward the Alabama state line. In Georgia, Corps dams in the ACT include Carters and Carters Reregulation Dams and Reservoirs (3,220 acres) on the Coosawattee River and Allatoona Dam and Reservoir (19,200 acres) on the Etowah River. The Alabama River begins at the confluence of the Coosa and Tallapoosa Rivers and ends in the delta region of south Alabama, connecting the river to the Gulf of Mexico. Corps dams in the lower ACT include a run-of-river and hydroelectric dam at R. F. Henry Lock and Dam, a hydropower dam at Millers Ferry Lock and Dam and William 'Bill' Dannelly Reservoir (17,200 acres), and run-of-river Claiborne Lock and Dam and Claiborne Reservoir (5,930 acres) on the Alabama River.

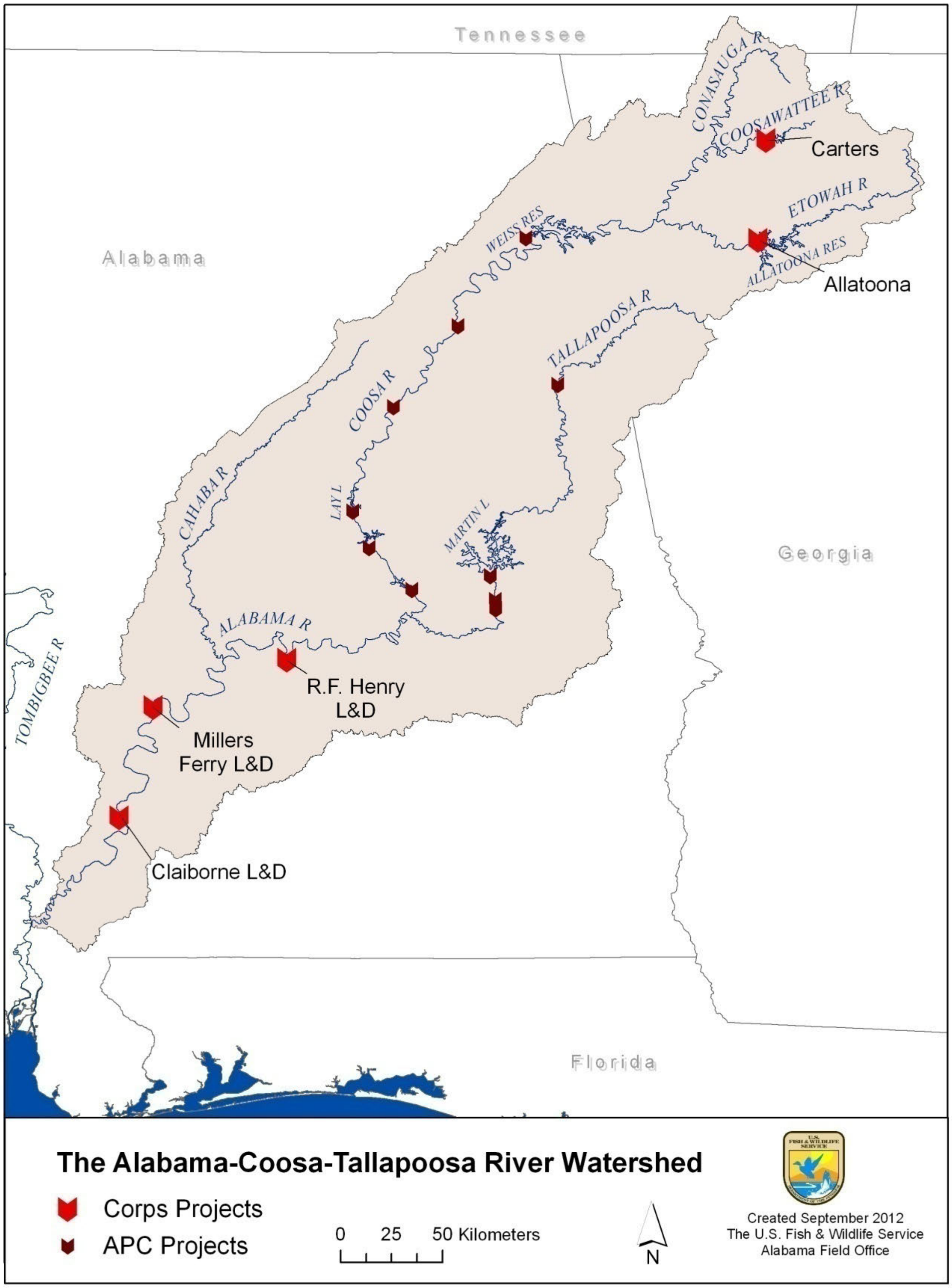


Figure 1. Map of ACT Basin.

DESCRIPTION OF CORPS' SELECTED PLAN

No Action Alternative

According to the Corps' response to the Service's PAL (Corps 2011), reservoirs in the ACT basin are authorized and operated to provide flood storage protection, hydropower, navigation, recreation, water supply, water quality, and fish/wildlife habitat. The Corps' goal is to use the currently defined guide curves to maintain a balanced use of conservation storage among the ACT reservoirs. Under the No Action Alternative, operations would continue as written in the Corps' 1951 Master Manual and project-specific WCM's, including incremental changes. While specifics can be found in the Corps' response to the Service's PAL (Corps 2011), general details include:

- H. Neely Henry Lake would operate under the guide curve under the current Federal Energy Regulatory Commission (FERC) license. The updated license is expected to be issued late 2012.
- A minimum flow of 240 cfs would be required at Carters Lake and Lake Allatoona.
- A target flow of 6,600 cfs from Claiborne Lake depending on inflow from the Alabama River, the Cahaba River, and tributaries.
- A combined 4,640 cfs release at Montgomery, Alabama for navigation purposes depending on releases from Jordan-Bouldin-Thurlow (JBT).
- Storage in Lake Allatoona would be 6,371 ac-ft and 13,140 ac-ft for the Cobb County-Marietta Watershed Authority (CCMWA).
- Storage in Carters Lake would be 818 ac-ft for water supply for the City of Chatsworth.
- Fish spawning operations on Lake Allatoona as outlined in District Regulation (DR) 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft Standard Operating Procedure (SOP) *Reservoir Regulation and Coordination for Fish Management Purposes* (Corps 2005) would continue.

Proposed Action Alternative Description

The Proposed Action Alternative is described in detail in the Corps' response to the Service's PAL (Corps 2011). While specifics can be found in the Corps' response, general details include:

- Implementation of a revised Alabama Drought Response Operations Proposal (ADROP) including zones 1, 2, and 3 of drought operation triggers with recommendations by the Service.
- Seasonal navigation releases (Alabama River 9.0-ft or 7.5-ft channel depth) and maintenance dredging would be provided. If sufficient flows cannot support a navigation channel of 7.5-ft, navigation would be suspended and flows at Montgomery would be reduced to 4,640 cfs or lower if one or more of the drought operations triggers would be exceeded. APC projects on the Coosa and Tallapoosa Rivers would continue to operate under their FERC license. The FERC relicensing is anticipated to be final at the end of the 2012 calendar year.
- H. Neely Henry Lake on the Coosa River (APC Project) would continue to work under the revised guide curve under a FERC license variance (with Corps concurrence).

- Lake Allatoona would provide a minimum flow of 240 cfs. A revised guide curve for Lake Allatoona would implement a phased fall drawdown period from early September through December and four action zones would mimic seasonal demands. Modifications to the hydropower schedule would allow greater operational flexibility to meet power demands while conserving storage; power generation would be reduced during annual drawdown in the fall (September-October).
- Carters Lake would provide a minimum flow of 240 cfs. Refined operations at Carters Lake would include two action zones to manage downstream releases. When Carters Lake is in Zone 1 Carters Reregulation Dam minimum flow releases would be equal to the seasonal minimum flow based on mean monthly flow upstream of Carters Lake.
- Storage in Lake Allatoona would be 6,371 ac-ft and 13,140 ac-ft for the Cobb County-Marietta Watershed Authority (CCMWA).
- Storage in Carters Lake would be 818 ac-ft.
- Fish spawning operations on Lake Allatoona as outlined in District Regulation (DR) 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft Standing Operating Procedure (SOP) *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005).

Drought Management Plan

The Corps, the Service, and APC are collaborating to develop a statewide drought plan. The Corps' Proposed Action Alternative would address the revised ADROP with Service enhancements. Drought operations will be driven by state line flows, system storage, and basin inflow triggers. Drought operations include headwater operations at Carters Lake and Lake Allatoona, Coosa and Tallapoosa APC projects, and operations downstream of Montgomery. The plan for the ACT consists of the four operational zones based on DIL as follows: DIL 0 – Normal operations, DIL 1 – Low basin inflows or low composite or low state line flow, DIL 2 – DIL 1 criteria + Low basin inflows or low composite or low state line flow, and DIL 3 – Low basin inflows + low composite + low state line flow. "The low basin inflow trigger is the sum of the total filling volume plus 7Q10 flow. Low 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 project. A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow." (Corps 2011). Such changes include reduced generation hours per day according to the drought level zone and minimum target flows reduced to 240 cfs for headwater operations at Lake Allatoona and Carters Lake.

Reservoir Operations

Under the Proposed Action Alternative specific water storage levels are identified for water supply. In Lake Allatoona 6,371 ac-ft is provided for the City of Cartersville, Georgia, and 13,140 ac-ft is provided for the Cobb County-Marietta Water Authority (CCMWA). For the City of Chatsworth, Georgia, 818 ac-ft is provided from Carters Lake. Operations at Lake Allatoona would be modified to use the four action zones which mimic the seasonal demands for hydropower. At Lake Allatoona a modified hydropower schedule would allow greater operational flexibility to meet power demands while conserving storage, and generation would be reduced during annual drawdown in the fall (September-October). At Carters Lake refined operations would include two action zones to manage downstream releases.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

Fish and wildlife resources without the project would continue to be influenced by the operations according to the Master Manual of 1951 and project-specific WCM's, including incremental changes. Operations without the project are described by the Corps as the No Action Alternative (Corps 2011). Results of current operations on the ACT include:

- Higher base flow than in a natural system due to navigational channel maintenance.
- Loss of lotic habitats and associated fluvial species assemblages.
- Alteration of the natural variation in the flow regime including low flows, high flows, large floods, and rise and fall rates.
- Risk of decreased freshwater inflow to south Alabama delta and Mobile Bay.
- Reduced floodplain and tributary connectivity due to low number of large floods.
- Poor water quality such as low dissolved oxygen, altered temperature values, and increased harmful wastewater concentrations.
- Hampered organism passage and access to spawning areas, refuge habitat, and the Gulf of Mexico.
- Fragmentation of aquatic populations.

Without the proposed project the ACT basin is an unnatural system due to years of human influence. The Corps and APC ultimately control the water levels in the reservoirs, reservoir holding times and releases, operations of the lock systems, maintenance of a navigable channel, and other operational activities associated with the dams and reservoirs. Water consumption, flood control, recreation, hydropower and navigation are among the operations that influence how water is balanced in the ACT.

CORPS' ANALYSIS OF PROJECT IMPACTS AND EVALUATION METHODOLOGY

1. Flow Dynamics

<u>1.1 Conservation and Recovery of Natural Flow Variability</u>

The Corps states that returning to a "natural" flow regime is not in their interest due to their other Congressionally authorized purposes of flood control, hydropower, and recreation. As stated by the Corps, the Proposed Action Alternative would include minimum monthly flow releases at Carters. They state that implementation of a seasonal non-hydropower peaking operation at Lake Allatoona would require a shutdown of hydropower production at the facility for a specified period of time; this would occur since there is no possible gradation of water releases from the main hydropower units between 0 cfs and 3,500 cfs. The other reservoirs in the ACT Basin were not addressed.

The planning activities and construction for new reservoirs in the upper ACT were not addressed in the PAL response. The following reservoirs are in various planning and construction stages and their impacts to the watershed should be considered:

1) Hickory Log Creek Reservoir
2) Russell Creek Reservoir
3) Richland Creek Reservoir
4) Shoal Creek Reservoir
5) Calhoun Creek Reservoir

Per the Service's request, the Corps provided ecosystem flow analyses using Indices of Hydrologic Alteration (IHA) and Service-recommended Microsoft Excel spreadsheets in their November 22, 2011, correspondence to the Service (Appendix VI). They provided a comparison of the No Action Alternative to the Proposed Action Alternative at three locations: Pine Chapel, Georgia (Coosawattee River below Carters Lake) and two locations near Rome, Georgia (Etowah River below Lake Allatoona and the Oostanaula River). Ecosystem flow guidelines have not been developed to compare with the No Action Alternative and the Proposed Action Alternative; however the similarity between the No Action Alternative and the Proposed Action Alternative is evident from the provided data. The greatest differences between the two alternatives are seen in the Etowah River below Lake Allatoona based upon the IHA. The plots for the Proposed Action Alternative and the No Action Alternative were similar for both Pine Chapel and Oostanaula River at Rome, Georgia. The Proposed Action Alternative results in the highest peak occurring during December in the Etowah River below Lake Allatoona, whereas the highest peak occurs late March for the No Action Alternative.

1.2 Protection and Enhancement of Remaining Free-flowing River Habitats

The Corps states that identifying and mapping free-flowing river habitats is needed but it is out of the scope of the WCM updates. The Corps provided information and analysis of sediment transport and buildup, shoaling, and erosion at reservoirs throughout the basin based on data collected up to 2010.

2. Water Quality

2.1 Dissolved Oxygen

Using the HEC-ResSim and HEC-5Q models, dissolved oxygen (DO) levels were modeled for the No Action, Proposed Action, and two other alternatives. Conditions were simulated for years 2001-2008 to demonstrate water quality conditions during different inflow amounts; 2003 representing a wet year, 2007 representing a dry year, and 2002 representing a normal year. Percent occurrence of DO less than a daily average of 5.0 mg/L below Carters, Allatoona, Weiss, Jordan, and Martin Dams, as well as near Cartersville, Georgia, were modeled for the alternatives. Longitudinal occurrence profiles by river mile (RM) were presented to predict the change in DO among the alternatives. The Corps' analysis included DO longitudinal profiles for:

- Etowah River for dry, wet, and normal years, May to October over the 2001-2008 period,

- Carters Lake downstream to Weiss Lake, May to October in a representative dry year,
- Coosa River to Montgomery, May to October in a representative dry year,
- Tallapoosa River to Montgomery, May to October in a representative dry year, and
- Alabama River, for a representative wet year and dry year.

The largest differences between the No Action and the Proposed Action Alternative based upon the 50% occurrence were as follows:

- Alabama River during a dry year, due to the drought operation plan: near RM 320, DO decreases by 1.0 mg/L for the Proposed Action Alternative compared to the No Action Alternative.
- Coosa River to Montgomery, May to October during a dry year, due to the drought operation plan: compared to the No Action Alternative, increases of 0.5 mg/L occur RM 350 to 400 while decreases in DO of 0.5 mg/L to 0.8 mg/L occur within RM 500 to 575.
- Tallapoosa River to Montgomery during a dry year, due to the drought operation plan: near RM 420 DO increases by 0.5 mg/L more than the No Action Alternative for the Proposed Action Alternative.
- Carters Lake downstream to Weiss Lake, May to October in a dry year, due to the drought operation plan: near RM 717 DO decreases by 0.8 mg/L for the Proposed Action Alternative compared to the No Action Alternative.

2.2 Water Temperature

Using the HEC-ResSim and HEC-5Q models, water temperatures were modeled for the No Action, Proposed Action, and two other alternatives. Conditions were simulated for years 2001-2008 to demonstrate water quality conditions during different inflow amounts; 2003 representing a wet year, 2007 representing a dry year, and 2002 representing a normal year. Longitudinal occurrence profiles by RM were presented to predict the change in median water temperature among the alternatives. The Corps' analysis included longitudinal profiles of the Proposed Action Alternative, No Action Alternative, and two other alternatives for a representative dry year (all year, 2007) for the:

- Alabama River,
- Coosa River to Montgomery, and
- Coosawattee (Carters Lake) to Weiss River;

growing season for a representative dry year (May-October, 2007) for the:

- Coosawattee (Carters Lake) to Weiss River and
- Etowah River to Weiss River;

and the composite of all years (2001-2008) for the:

- Alabama River and

- Tallapoosa River to Montgomery.

No actual water temperature values were provided. The largest differences between the No Action and the Proposed Action Alternative based upon the 50% occurrence were as follows:

- Alabama River during a dry year, due to the drought operation plan: near RM 345 median water temperature increases by 1.2° C more than the No Action Alternative for the Proposed Action Alternative.
- Coosa River below Jordan Dam, during a dry year, due to the drought operation plan: near RM 355 median water temperature increases by 1.0° C more than the No Action Alternative for the Proposed Action Alternative.
- Coosawattee River, during a dry year: at Carters Lake (RM 720) median water temperature decreases by as much as 0.8° C below the lake for the Proposed Action Alternative in comparison to the No Action Alternative.
- Etowah River, May-October during a dry year: below Lake Allatoona, median water temperature decreases by as much as 1.3° C for the Proposed Action Alternative in comparison to the No Action Alternative.

2.3 Wastewater

Using the HEC-ResSim and HEC-5Q models, percent wastewater inflow was modeled for the No Action, Proposed Action, and two other alternatives. Conditions were simulated for a representative dry year, 2007, to demonstrate water quality conditions during low flow. Longitudinal occurrence profiles by RM were presented to predict the change in percent of wastewater in flow among the alternatives. Profiles were presented for the Alabama River, Coosa River to Montgomery, Coosawattee River to Weiss River, Etowah River to Weiss River, and Tallapoosa River to Montgomery. There were not large differences between the No Action and the Proposed Action Alternative. Based upon the 50% occurrence, observations for both the No Action and Proposed Action Alternative were as follows:

- The highest percentage of wastewater is found in a ten-mile stretch between Rome, Georgia and Weiss Lake on the Coosa River.
- The average percentage of wastewater was highest (near 6%) for the Alabama, Coosa, and Coosawattee Rivers.

2.4 Sediment Load

The Corps states that large reservoirs, such as Lake Allatoona and R.L. Harris Lake, act as sediment traps and starve the downstream channel of fine-grained sediments. They state that run-of-river dams, such as Claiborne Reservoir, generally allow all sizes of suspended particles to be transported downstream of the dams. Tailwater degradation curves were provided for Claiborne Lake, R.F. Henry Lock and Dam, Logan Martin Lake, H. Neely Henry Dam, Weiss Lake, R.L. Harris Lake, Carters Lake (historic and low-flow conditions), and Lake Allatoona. As stated by the Corps, tailwater degradation, or lowering of the river bed elevation immediately downstream of a dam, is occurring or has occurred below Lake Allatoona during construction, R.F. Henry Lock and Dam, and below Claiborne Lake.

The Corps provided an evaluation of pool conditions to identify if shoaling is a significant issue. Claiborne Lake, Millers Ferry Lock and Dam and William "Bill" Dannelly Lake, R.F. Henry Lock and Dam and R. E. "Bob" Woodruff Lake, Logan Martin Lake, H. Neely Henry Lake, Weiss Lake, Lake Allatoona, Carters Lake, and R.L. Harris Lake evaluations were provided. Data shows that several reservoirs, such as Logan Martin Lake, H. Neely Henry Lake, and Weiss Lake, have become more stable over time partially due to increased density of vegetation. Lake Allatoona has an increased amount of sediment due to development in the area. The Corps states that erosion has occurred on cropland and has contributed to sediment into the ACT Basin.

3. Floodplain Connectivity

Low flow and high flow analyses were conducted by the Corps' at three locations to compare the Proposed Action and No Action Alternative: Pine Chapel, Georgia, Etowah River at Rome, Georgia, and Oostanaula River at Rome, Georgia. Those results were transmitted in the Corps' November 22, 2011, response to the Service's questions regarding the Corps' June 6, 2011 document (Appendix VI). The high flow analyses are pertinent to floodplain connectivity. Ecosystem flow guidelines were not included in the Corps' document to compare the alternatives to pre-dam conditions. However, a comparison between the alternatives indicates they are largely similar, with the greatest differences in the Etowah River as a result of operational changes at Lake Allatoona.

4. Fish Passage

Ongoing studies are being supported by the Corps to determine the efficacy of using lockages for fish passage. In collaboration with ADCNR, The Nature Conservancy (TNC), Auburn University, and the Service, the Corps has supported "dummy" lockages at Claiborne and Millers Ferry lock and dams. Lockages were performed at these facilities in 2010 and 2011 February through May. The Corps is a partner of the Alabama River Fish Working Group whose goal is to study the various ways to allow migratory fishes to move upstream to historic spawning areas. The group is made up of partners from the Geologic Survey of Alabama (GSA), ADCNR, TNC, Auburn University, the Service, and the Corps. The Corps states that other studies are beyond the scope of the WCM update.

5. Reintroductions and Enhancements for Listed Species

The Corps states that reintroductions and enhancement of habitats for federally-listed species are beyond the scope of the project. The Corps has provided funding support for several listed species surveys within in the ACT Basin. These surveys were conducted in anticipation of eventually preparing a Biological Assessment (BA) for Section 7 ESA consultation. For example, Jim Godwin of the Alabama Natural Heritage Program (ALNHP) performed a study to determine burrow occupancy of the Red Hills salamander at Haines Island Park and surveyed for populations west of the Alabama River (2011). Carol Johnston and Heath Haley of Auburn University surveyed small-bodied fishes in the Alabama River and associated tributaries (2011). Allan Shotz of the ALNHP performed a survey of listed and sensitive plant and select animal species on Corps landholdings along the Alabama River (2011). ADCNR performed two studies, one by Michael Buntin and Jeff Garner to delineate the mussel bed at Alabama RM 207 and to determine the abundance of heavy pigtoe (*Pleurobema taitianum*) at the location, and a second survey conducted by Buntin, Garner, and Todd Fobian to better understand the distribution of Tulotoma snail (*Tulotoma magnifica*) in the Alabama River (2011). The Corps provided updated mollusk surveys that were recently conducted in the Coosa drainage of Georgia.

6. Restoration and Maintenance of Healthy Water Quality Parameters

The Corps states that the level of effort needed to accomplish this is beyond the intent of the current project. The Corps will continue to work closely with stakeholders in adaptive management and seek opportunities for future study.

7. Development of Adaptive Management Protocols

The Corps states that the development of research and monitoring efforts goes beyond the scope of the project.

8. Reservoir Fisheries

Per the Service's request, the Corps provided a reservoir fisheries analysis in their November 22, 2011, correspondence to the Service (Appendix VI). They stated that the proposed changes would most notably affect lake levels in the upper portion of the basin, particularly Lake Allatoona, so the reservoir fisheries detailed analysis was provided for Lake Allatoona only. The impacts of the No Action and Proposed Action Alternative on reservoir fisheries were based on the premises that reservoir water level fluctuations can impact reproductive success of game fishes. The analysis used a performance measure previously developed by the Service that characterizes the effect of the alternatives to habitat suitability for recreationally important species. The performance measure scores indicate that the No Action Alternative would be similar to the Proposed Action Alternative, without notable differences between the two.

EVALUATION OF THE PROPOSED ACTION ALTERNATIVE

1. Flow Dynamics

<u>1.1 Conservation and Recovery of Natural Flow Variability</u>

A natural flow regime similar to historic flows (e.g., base, seasonal, and minimum/maximum flow levels, frequency/duration of low/high pulse flows, flow rise/fall rates and frequency of flow reversals) is essential to the integrity of the basin's riverine fauna and habitats. Riverine biota are adapted to the variation in flow and are dependent upon these changes to carry out their life strategies. Peaking hydropower releases of water at high velocities can adversely impact the development of riverine flora and fauna and decrease biodiversity. Although flows in the ACT Basin have been altered, some components of a natural flow regime could be mimicked.

The Corps is proposing nearly no changes that would mimic components of the natural flow regime. An exception is the zones given in the Proposed Action Alternative for Carters Lake, which may have beneficial impacts to the flow regime in the downstream Coosawattee River. It is important to maintain flow in the ACT during all hydrologic conditions. When a drought is identified a minimum flow must remain to ensure biota are able to survive. Proposed minimum flow releases that equal a monthly 7Q10 inflow upstream of Carters Lake would create requirements simulating a more natural flow regime when Carters Lake is in Zone 1, an improvement to the current annual 7Q10 minimum flow of 240 cfs. The 7Q10 low flow statistic is calculated using the smallest values of mean discharge over 7-consecutive days during a set time period, such as monthly or annually, with a 10-year recurrence interval. The release of a monthly 7Q10 flow is not proposed for the other dams in the ACT Basin. This concept would aid in creating a more natural flow environment at those facilities in which a static annual 7Q10 flow has been applied in the past.

A recent study conducted by the United States Geological Survey (USGS) above and below both Carters Lake and Lake Allatoona assessed fish populations at shoal habitats (Freeman et al. 2011, unpublished). In the Coosawattee River, species richness results were similar for the sites upstream and downstream of Carters Lake. In the Etowah River, species richness of the downstream sites was estimated to be reduced by nearly two-thirds compared to the upstream sites. Fewer individuals were sampled at the lower river sites compared to the upstream sites in both the Etowah and Coosawattee Rivers. Freeman et al. (unpublished) concluded that the effects of altered sediment transport and reduced inputs of carbon and other nutrients are realized below both Carters Lake and Lake Allatoona due to the physical presence of the dams. Results of dam operations including hydropeaking, low flow periods, and low dissolved oxygen have likely reduced the number of shoal-dwelling fish species. The low number of small-bodied fishes downstream of Allatoona Dam compared to Carters Dam may be evidence of stronger impact to the Etowah River from the hydropeaking regime. The reregulation dam at Carters Lake dampens the hydropeaking influence on the Coosawattee River and likely contributes to the healthier fish community.

The Service recognizes that the proposed reservoirs could have an impact on conservation and recovery of natural flow variability. Changes to storage, interbasin transfers, withdrawals, and hydropower should be addressed in the future.

In Alabama, FERC has issued a preliminary permit to Hydro Green Energy LLC (FERC Project Docket No. 13519-000) for studying the addition of hydropower at Claiborne Lock and Dam. Our concerns with future impacts at this site include degradation of fish and wildlife habitat, water quality, and passage of migratory fishes. The Service will coordinate with the permittee and FERC to formulate appropriate measures to protect, mitigate, and enhance fish and wildlife resources affected by this potential development through FERCs licensing process. We also encourage the Corps to include the Service in future conversations regarding hydropower infrastructure at Claiborne Lock and Dam, if the proposal moves forward.

At all the projects in the ACT Basin we recommend the Corps restore parameters of a natural flow regime by reducing hydropeaking releases, allowing large floods to reach floodplains, and mimicking the natural hydrograph as much as possible by allowing for seasonal fluctuations in river discharge.

1.2 Protection and Enhancement of Remaining Free-flowing River Habitats

Riverine biota are adapted to flowing water conditions. Flow parameters, such as velocity, timing, and frequency, signal organisms to complete their life history strategies (Poff and Ward 1990, Allan 1995, Richter et al. 1996). Restoration of a natural flow regime will improve water quality and physical habitat. For example, ensuring adequate flow is released from Claiborne Dam is important to maintain proper freshwater inflows to the Tensaw delta and Mobile Bay. Other examples such as inundation of Claiborne Dam, opening locks for fish passage, and reduction of large peaking events for hydropower can aid in restoration of free-flowing habitats. We recommend taking steps towards restoring a more natural flow regime throughout the ACT Basin.

2. Water Quality

Alabama and Georgia's 303(d) lists include waterbodies that occur in the ACT Basin. These waterbodies are in need of attention and consideration in the WCM updates and future operations of the Corps. Water quality issues include nutrient loads, metal contaminants, pathogens, organic enrichment, and siltation. We recommend measures to improve the quality of streams and river segments throughout the ACT Basin, with special consideration for 303(d) listed streams and reservoirs. Our recommendations are provided in sections 2.1-2.4.

2.1 Dissolved Oxygen

The Alabama State standard for DO is 5.0 mg/L. Georgia's State standard for DO is a daily average of 5.0 mg/L and an instantaneous value of 4.0 mg/L for waters supporting warmwater species of fish. The Proposed Action Alternative's largest decreases in DO from the No Action Alternative are predicted to be the Coosa River near RM 575 (-0.8 mg/L), below Carters Lake near RM 717 (-0.8 mg/L), and the Alabama River near RM 320 (-1.0 mg/L). Therefore, although the Proposed Action Alternative predicts DO improvements at some locations, the Proposed Action Alternative is less favorable in terms of DO than the No Action Alternative. DO levels were modeled to be lowest in a dry year due to drought operations and lower pool elevations.

The Alabama Department of Environmental Management (ADEM) completed water quality surveys in 2008 and 2009 on the Alabama River. Continuous data were collected from the river bottom at four locations during summer months: Alabama River Pulp Company, Selma, Prattville, and Weyerhaeuser. In 2008, DO values fell below the State standard of 5.0 mg/L at Selma, Weyerhaeuser, and Prattville. In 2009, DO levels remained above the State standard except at Selma. The Selma and Weyerhaeuser Alabama River locations are of specific concern due to the number of low DO data logs and the number of sensitive species near these locations. Poor water quality during 2008 was likely due to little flow during drought conditions, creating a lentic environment. Sampling at several elevations in the water column is important; the data sonde for this study was located near the river bottom. This location provided different values when compared to data collected near the water surface. Bottom data is an important indicator in addition to surface data, because benthic biota experience bottom conditions. In future studies we encourage data to be collected from the river bottom as well as the water surface to more accurately understand water quality conditions.

Although there was no noticeable change among the alternatives for the percent occurrence of DO levels at the modeled outflows in the ACT Basin, the analyses that were provided demonstrate the ongoing unacceptable levels of low DO caused by some of these Corps facilities. The highest percentage of low DO occurrence was at Allatoona Dam outflow. The outflow was modeled to fall below the State standard 40% of the time (2000-2008) and to fall as low as 2 mg/L during these years. Low DO levels below Allatoona Dam are a concern and need to be addressed. Data collected by the Service in the summer of 2009 on the Etowah River below Allatoona Dam indicated DO levels lower than 1.0 mg/L (USFWS 2012).

Action should be taken to maintain State water quality standards during all conditions. During low flow events DO levels should not fall below the State standard and suitable flow should be maintained throughout the river system to increase water quality. Maintaining suitable flows in the ACT Basin is dependent upon cooperation between the Corps and APC.

Due to the recurring problem of low DO below dams, methods have been developed to improve oxygen levels at other locations. For example, Tennessee Valley Authority (TVA) has installed dam-specific devices to improve DO downstream of dams. Examples include aerating turbines, surface-water pumps, low-pressure air blowers, aerating weirs, and oxygen injection systems (http://www.tva.gov/environment/water/rri_oxy.htm). These types of systems should be examined as ways to improve water quality below Corps dams in the ACT Basin. We recommend that the Corps seek additional authorization and funding (e.g., 1135 funds or aquatic ecosystem restoration funds) to remedy the water quality problems at the ACT projects.

We recommend the Corps take action to improve DO throughout the basin with special consideration below dams and to explore devices that can increase DO levels.

2.2 Water Temperature

Temperature is an important quality to riverine flora and fauna and temperatures outside of seasonal norms can stress biota. Most warm-water fishes have an approximate upper limit of 30° C meaning that temperatures above this will stress the animal and lower survival rates while cold-water fishes generally cannot survive temperatures above approximately 25° C for very long (Allan 1995). According to Alabama State water quality standards, water temperature shall not exceed 32.2° C in streams, lakes, and reservoirs throughout the state. In the Tennessee and Cahaba River Basins, and for that portion of the Tallapoosa River Basin from the tailrace of Thurlow Dam at Tallassee downstream to the junction of the Coosa and Tallapoosa Rivers, temperature shall not exceed 30° C. According to Georgia State water quality standards, water temperature shall not exceed 32.2° C. At no time is the temperature of the receiving water to be increased more than 2.8° C above intake temperature in freshwater. In primary trout streams or smallmouth bass streams (as designated by GDNR-WRD), there shall be no elevation of natural stream temperatures. In streams designated as secondary trout waters, there shall be no elevation exceeding 1.1° C of natural stream temperatures.

The largest differences between the Proposed Action Alternative and the No Action Alternative would occur during drought operations. In Georgia, water temperatures under the Proposed Action Alternative decrease below Corps reservoirs by as much as 0.8-1.3° C (Coosawattee and Etowah Rivers, respectively). In Alabama, water temperatures increase by as much as 1.0-1.2° C (Coosa and Alabama Rivers, respectively).

Existing water temperatures in multiple locations in the ACT Basin are already artificially depressed or elevated. In Alabama, temperature was recorded by ADEM during 2008-2009 summer months at four locations: Alabama River Pulp Company, Selma, Prattville, and Weyerhaeuser. We recommend water temperatures below Corps' facilities in Alabama be maintained at least below the State standard and below 30° C when possible.

In Georgia, existing water temperatures below Lake Allatoona are artificially depressed as a result of current operations. A recent study on the Etowah River investigated water temperature impacts from Allatoona Dam (USFWS 2010). Water temperature was modeled from Allatoona Dam to 31 miles downstream in June 2009 to compare water temperatures among an unimpounded flow, a minimum flow-hypolimnetic release, and a hydropower generation-hypolimnetic release of 3,600 cfs. Water released from Allatoona Dam was 8.3° C colder than the temperature predicted from the unimpounded scenario. Using the unimpounded temperature gradient as the ideal scenario, temperature for the minimum flow release was not restored until 27.7 miles downstream. Under the hydropower generation release scenario the temperature never recovered to unimpounded modeled temperatures in the 31-mile study area. The study predicted water temperature could vary between 0-8° C daily. The artificial depression and fluctuations in water temperatures are not beneficial to native aquatic populations below Allatoona Dam. However, a population of striped bass (*Morone saxatilis*) does utilize the cool water below Lake Allatoona as a thermal refuge, specifically in summer months.

<u>2.3 Wastewater</u>

The No Action Alternative and the Proposed Action Alternative are similar; therefore, the Preferred Action Alternative is not less or more favorable than the No Action Alternative. As presented by the Corps, percent potential wastewater for all alternatives did not exceed approximately 10% of total flow during low flow conditions. Cooperation between the Corps and other facilities along the ACT is needed to maintain wastewater levels that do not damage aquatic resources.

<u>2.4 Sediment Load</u>

The number of dams in a watershed influences the quantity and size of sediment that is transported by rivers. Sediment falls out and becomes trapped in reservoirs leaving downstream river reaches starved of fine grained substrate. Because of the lack of sediment the channel downstream of a dam may respond to sediment starvation by down cutting, bank erosion, and channel widening. Channel stability and amount of shoaling of reservoirs in the ACT was also addressed. The Corps concluded that shoaling has occurred but in some areas vegetation has allowed for more sediment stability. The Service recognizes that tailwater degradation and shoaling are due to original construction of the dams, but measures to reduce sediment and shoaling are recommended and include bank stabilization above dams, avoidance of structural disturbance to rivers, and minimization of disturbance to river banks. Fine sediments fill interstitial spaces of larger substrate particles such gravel, cobble, and boulders and can eliminate these structures as possible habitat. Buntin and Garner (2011) found no Tulotoma snails where the boulders were embedded and the interstitial spaces were choked, although some sediment accumulation correlated with presence of the snails at other locations. We recommend monitoring embeddedness and erosion rates downstream of dams to determine impact on available habitat and implement stabilization measures to reduce further erosion.

3. Floodplain Connectivity

The Corps provided high flow analyses for the No Action Alternative and the Proposed Action Alternative at several locations in Georgia. The alternatives are similar, with the exception of the Etowah River below Lake Allatoona. The Corps did not provide flow guidelines to compare these alternatives to a pre-dam condition; therefore we are unable to draw a conclusion as to which alternative is more similar to pre-dam conditions in the Etowah River.

Ecological integrity of riverine systems is intimately connected to the quality and quantity of streamside floodplain forests and wetlands. The level of connectivity affects the vegetation ecology of adjacent wetlands and floodplain forests, as well as the fish and wildlife resources dependent upon them. Significant river-dependent habitats include the diverse floodplain forests, tributaries, wetlands and bottomlands. Forest and grassland communities within the floodplain zone which require disturbances such as high water and bank sloughing, are often distinctly different than communities outside that impact zone. These unique environments are driven by the moisture availability, fluvial processes and the daily interaction between aquatic and terrestrial communities.

The Corps owns 23 landholdings along the Alabama River. The Alabama Natural Heritage Program (ALNHP) performed surveys for imperiled wildlife in these areas in 2010 and 2011 (Schotz 2011). Upland and mesic hardwood forest, bluff, prairie and wetland habitats were identified in the landholdings. Results from these studies show that the Corps landholdings support or have the potential to support species of concern.

Protecting and restoring aquatic habitats associated with the floodplain are essential to ACT Basin fish and wildlife; such habitats include shorelines, riparian zones, and associated wetland systems. These systems serve as spawning habitat and refugia, allowing rivers to reach these environments and rejuvenate the ecosystems. The National Weather Service with the National Oceanic Atmospheric Association and U.S. Geological Survey provide the Advanced Hydrologic Prediction Service and flood categories for gages ranging from action stage to major flood stage (http://www.srh.noaa.gov/serfc/). At most gages flood impact descriptions of the various flood stages are provided. These data can provide the gage height needed for the rivers to reach the floodplain. Large floods that reach the floodplain and tributaries are important in order to provide foraging material, spawning habitat and refugia for aquatic species. Allowing river levels to reach the floodplain is welcomed, and should be considered where negative impacts to adjacent landowners will not occur.

Site	Location	Action Stage (ft)	Flood Stage (ft)
Etowah River near Cartersville	34.143° N, 84.839° W	16	18
Coosawattee River near Redbud	34.564° N, 84.833° W	22	25
Alabama River at R.F. Henry L&D	32.322° N, 86.784° W	122	122
Alabama River near Millers Ferry	32.100° N, 87.398° W	61	66
Alabama River near Claiborne	31.613° N, 87.551° W	35	42

Table 1. Action stage (bankfull height) and flood stage (first stage of flooding) corresponding (at or near) Corps dams.

4. Fish Passage

It is widely acknowledged that dams impede the movements of fish and other aquatic biota. Movement throughout a river system is important to prevent depletion of local resources and to maintain genetic variation. Migratory species, such as Alabama sturgeon (*Scaphirhynchus suttkusi*), require long stretches of free flowing river to carry out their life history strategies. Mussel species depend on fish hosts that are not immune to their glochidia and this strategy can be halted without proper upstream and downstream movement.

Inundation and open flood gates at Claiborne and Millers Ferry, respectively, increase fish passage on the Alabama River (Mettee et al. 2005). A study completed by Mettee et al. (2005) found that attraction flows and "dummy" lockages benefit fish movement at Millers Ferry and Claiborne Lock and Dams. Data suggest that fishes may remain in lock chambers for long periods of time, but attraction flows encourage movement out of the locks.

Auburn University, with the aid of the Corps, the Service, TNC, ADCNR, and GSA conducted a study on "dummy" lockages and fish passage at Millers Ferry and Claiborne and Lock and Dams to evaluate the effectiveness of specialized lock operations for fish passage, February 1st through May 31st (Simcox et al. 2011). Fishes were tagged in 2010 and 2011 and tracked using numbered internal anchor tags and internal sonic tags. Results show that specialized lock operations can help fish movement upstream, especially during spring months (spawning period) when movement into the lock chambers was most frequent. During periods of low flow when no inundation occurred at Claiborne Dam, "dummy" lockages offered a method of fish passage (Table 3). Passage occurred by means of lockages for navigation operations and lockages specifically for fish passage (Table 3). A report produced by ADCNR (Rider 2010) compiled data from this study collected during March through April 2010. The results show that fish move through the locks and can swim upstream over dams if the dam is inundated, or overtopped.

	Days operated	Days inundated	Days with boat traffic	Fish passage lockages	Days for potential passage
Claiborne					
2010	33	34	10	122	67
2011	32	13	9	125	45
Millers Ferry					
2010	89	-	27	356	89
2011	80	-	14	162	80

Table 2. Summary statistics for Claiborne and Millers Ferry Lock and Dams from February 1st to May 31st (Simcox et al. 2011). Days for potential passage refers to the number of days that fish had the opportunity to move upstream of the dam, either through lock operations or dam inundation.

		Fish Passage				**Operation**	
	Total passage events	**Upstream over**	**Upstream lock**	**Downstream over**	**Downstream lock**	**Navigational**	**Fish passage**
Claiborne							
2010	17	1	3	13	0	0	3
2011	38	15	1	22	0	0	1
Millers Ferry							
2010	2	0	2	0	0	1	0
2011	3	0	3	0	0	0	3

Table 3. Summary of fish passage through lock events specific for passage and lock events for navigation operations at Claiborne and Millers Ferry Lock and Dams. Values represent number of tagged fish. At Claiborne Lock and Dam, two other fish passed using an undetermined method (Simcox et al. 2011).

Studies determining the effectiveness of attraction flows and opening of lock gates to allow fish passage should continue. We request a cost benefit analysis be performed comparing the operation and maintenance of the current navigational channel and system of locks and dams on the Alabama River versus the costs and economic benefits associated with maintaining the same system for maximum environmental benefits. A summary of the number of commercial barges and other craft that have and are currently utilizing the navigational system should be made available as part of the DEIS.

On October 9, 2012, changes to future lock operations at Corps dams were announced (Release no. 12-031) (Corps 2012). Hours of operation have been determined based upon historic usage patterns; locks will be operated four days a week and all commercial traffic will be by appointment only. The announcement states that lockages will be made for seasonal fish passage. Usage will be reviewed annually and adjustments will be made as needed.

We recommend the Corps continue support for fish passage research, install attraction flows, and frequently open locks during the spring fish migration period.

5. Reintroductions and Enhancements for Listed Species

Reintroductions and enhancements for listed species are key management actions to improve rare aquatic populations and habitat in the ACT Basin. Efforts have begun with partners in Alabama to reintroduce rare species into these river systems. Collaboration between the Service and Alabama Aquatic Biodiversity Center (AABC) of ADCNR has resulted in reintroduction of numerous species that are showing success. "A Plan for the Population Restoration and Conservation of Freshwater Mollusks of the Mobile River Basin" outlines propagation, reintroduction, and augmentation goals of our state, Federal, and non-government partners (MRBMRC 2010).

One example of the efforts of the Mobile River Basin Mollusk Recovery Committee (MRBMRC) is a proposed reintroduction of the federally endangered interrupted rocksnail (*Leptoxis foremani*) into the Weiss Bypass of the Coosa River near Centre, Alabama (Johnson 2010). Test populations will be introduced to determine if the habitat is suitable. Efforts such as these provide the opportunity to recover imperiled wildlife in the ACT Basin; we encourage the Corps to work with us to achieve the goals outlined by the MRBMRC. Collaboration between the Corps and APC will improve the chances of providing adequate habitat in the Weiss Bypass. Other mollusk studies include ADCNR's heavy pigtoe survey at Alabama RM 207 and Tulotoma snail surveys in the Alabama River (RM 63.7 – 294.9).

The survey for heavy pigtoe (Alabama RM 207) resulted in a low number of individuals (n=2, estimated 0.013 per m^2) and no evidence of recruitment in one of the last known locations of this species (Garner and Buntin 2011). The mussel bed does appear to be healthy however, supporting 13 mussel species (approximately 12.8 per m^2). Propagation efforts for the heavy pigtoe have been undertaken by the AABC. Surveys for Tulotoma snail and available habitat were performed in the Alabama River (Alabama RM 63.7 – 294.9) using Side Scan Sonar and SCUBA ground truthing late summer and autumn of 2010 (Garner et al. 2010). Tulotoma snail was present at 5 of the 85 sampled sites. The snail was found to have a scattered distribution in the Alabama River and was associated with boulder habitat that lacked heavy siltation. We recommend protection of known locations of sensitive and listed species and efforts to increase fish passage to complete the life cycle of mussels.

An additional mollusk survey was conducted at four regulated rivers in the upper ACT Basin, the Coosa, Oostanaula, Etowah, and Coosawattee (Dinkins and Hughes 2011). Presence/absence data of mussel and snail species collected at 60 sites were compared to collections made in 1997. The study found that species richness has declined since 1997; there were three fewer species in the Coosawattee and Oostanaula rivers and four fewer species in the Coosa River. The Etowah

River continues to have a low number of species (two) and did not change from 1997 survey results. We recommend efforts to improve the health of these rivers and support for ongoing studies.

The Corps owns property within the floodplain of the Alabama River. Maintaining connection to the floodplain and preservation of these habitats is important to the fish and wildlife in the ACT Basin. The ALNHP conducted two separate surveys on these Corps landholdings. Red Hills salamander burrow occupancy rates were studied on Haines Island and four Corps properties along the western bank of the Alabama River within the Red Hills were surveyed for salamanders. On Haines Island a total of 503 potential burrows were identified and 61 salamander detections were recorded within 32 burrows. Other properties surveyed were the northern-most property in Clarke County at the Clarke-Monroe-Wilcox county line; immediately across the river from Haines Island Park at Davis Ferry, Monroe County; Silver Leaf Creek Park, Clarke County; and at Claiborne Lock and Dam, Monroe County. No Red Hills salamanders were documented at these locations due to lack of proper habitat (Godwin 2011). The second survey conducted by ALNHP was an inventory of federally-listed and sensitive plant and select animal species on Corps properties along the Alabama River (Schotz 2011). The survey documented 19 occurrences of 15 rare plant species, as recognized by ALNHP as species of conservation concern, one being the federally listed Price's potato bean (*Apio priceana*) which is found on open, rocky, wooded slopes and floodplain edges. The survey included 3 G-1 ranked plant species and 3 G-2 ranked plant species. The locations which support species of concern are Jones Bluff Recreational Area, Elm Bluff Recreational Area, Holy Ground Battlefield Park, and Haines Island. No rare animal species were collected. We recommend preservation of all Corps landholdings, with special attention to the locations where species of concern can be found.

Johnston and Haley (2011) sampled the fish assemblage in the Alabama River at gravel/sand bar habitat and in various tributaries below Claiborne Lock and Dam. The study identified 55 fish species, one being the Crystal darter (*Crystallaria asprella*) which is protected by the Alabama Wildlife and Freshwater Fisheries Division of the ADCNR. Results show that gravel/sand bars and tributaries are important habitats for fish. The data collected were compared to historic sampling performed by R. D. Suttkus and GSA; there was little similarity between historic and current samples, suggesting shifts in the fish assemblage. The study showed a loss of habitat for Alabama River fishes due to the absence of many historic gravel/sand bar sampling sites.

The ACT Basin is home to many imperiled fish and wildlife. In the upcoming years the Service has the responsibility of determining the status of many additional species that may be listed under the ESA. Opportunities are available to work towards preventing species from becoming federally-listed and we encourage the Corps to explore these options.

We recommend the Corps support the Service and their partners to determine the status of petitioned species. This can be done by providing funds, conducting surveys and research, monitoring population sizes of imperiled species, habitat restoration and using results based management. These actions could improve the quality of the ACT Basin and allow for species to recover before reaching threatened or endangered status.

6. Restoration and Maintenance of Healthy Water Quality Parameters

Data provided by the Corps demonstrates that water quality parameters generally fall within State standards but at several locations water quality is degraded, specifically at Lake Allatoona (approximately 40% occurrence of DO levels below 5.0 mg/L). Improvements to water quality at this location should be made a priority. Wastewater outflow and releases of water above 30° C should be monitored. We recommend studies dedicated to determining water quality requirements for species and the impacts to species from changes in operations, as well as improvements made to water quality at Lake Allatoona.

7. Development of Adaptive Management Protocols

Adaptive Management Protocols enable a flexible, reactive strategy to improving the ACT Basin. Studies have been performed to learn more about the basin but data gaps still exist. With the ongoing efforts to fill those gaps, the additional information will allow us to make better educated decisions in the future. We do not agree that development of Adaptive Management Protocols is outside the scope of this project and we encourage the Corps to explore this further. Due to the high biodiversity within the ACT Basin, we are unable to model or predict how the Corps' operational changes will impact species on a basin-wide scale. Adaptive Management Protocols will allow us to monitor and learn how the ecosystem responds to water management and have the ability to alter operations to improve the ACT Basin if necessary. Studies, in collaboration with our partners, to begin the protocols include water availability, a forecast of water needs for humans and the environment, and how those needs can be met are recommended by the Service.

8. Reservoir Fisheries

Reservoir fisheries may be impacted through changes in water levels, changes in reservoir flushing rates, and associated changes in water quality parameters. The spawning period of reservoir fisheries is crucial for strong year classes, generally occurring March – May while the crucial period for rearing is June – November; stable elevation in the reservoirs is needed during these times. Other concerns include the sediment load in the tributaries associated with the reservoirs. Maintaining connectivity to tributaries is important for the life history strategies of reservoir species. Performance measure scores were calculated for the No Action Alternative and the Proposed Action Alternative in Lake Allatoona. There were no notable differences between the two. The Corps states that the median performance measure values indicate a lack of suitable fisheries habitat. Recommendations from the Service include studies to determine impacts to reservoir fishes from unstable water levels and drawdowns due to drought during spawning and rearing periods and enhancements to habitat in Lake Allatoona.

FISH AND WILDLIFE CONSERVATION MEASURES AND RECOMMENDATIONS

The following bullets provide a consolidated list of the recommendations that we justified in the preceding "Evaluation of the Proposed Action Alternative" section:

- Include the Service in future conversations regarding hydropower infrastructure at Claiborne Lock and Dam, if the proposal moves forward. (1.1. Conservation and Recovery of Natural Flow Variability)
- Continued cooperation between the Corps and APC to ensure proper releases from the upstream dams and delivery of water to the Weiss Bypass channel is needed. (Service 2010)
- Develop an adaptive management plan and monitoring program to allow greater understanding of riverine ecosystem response to complex variables and add additional data to models as more data are collected. (7. Development of Adaptive Management Protocols)
- Improve and maintain water quality parameters suitable for fish and wildlife for all life stages under a variety of flow conditions. (1.1. Conservation and Recovery of Natural Flow Variability)
- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrates (e.g., mussel and snail populations). (7. Development of Adaptive Management Protocols)
- Improve connectivity to the floodplain. (3. Floodplain Connectivity)
- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the large number of aquatic species. (4. Fish Passage)
- Explore and implement opportunities (e.g., with the AABC) to augment/reintroduce mollusks and fishes into appropriate habitats. (5. Reintroductions and Enhancements for Listed Species)
- Develop Geographic Information Systems (GIS) databases that identify, characterize (e.g., bathymetry, current velocity, substrate, and Side Scan Sonar), and map stable riverine habitats. (Service 2010)
- Maximize Corps collaboration with stakeholders. (7. Development of Adaptive Management Protocols)
- Implement mitigation measures for the loss of aquatic resources as a result of the creation of the Carters Lake Project. Terrestrial and stream impacts should be calculated and mitigation measures should be implemented. (Service 2010)

SUMMARY AND THE SERVICE'S POSITION

Neither the Corps' Proposed Action nor the No Action Alternative, because of the limited scope of the proposed updates, will address all of the Service's conservation concerns in the ACT basin. These concerns include lack of improvement to water quality, lack of support for reintroduction and enhancements for listed species, minimal mimicking of components of the natural flow regime, no reduction of effects of hydropower peaking flows, and no recognition that fish passage at ACT dams is within the scope of the current effort.

The Service fully supports the ADROP. During drought conditions water operations will be driven by drought triggers shaped by low basin inflow, state line flow at Mayo's Bar, and low composite conservation storage in APC projects. The Service also supports the suspension of navigation while drought conditions are met. The Service supports the ongoing efforts of the

Corps in fish passage through locks and dams, but encourages additional studies at upstream facilities.

The Service emphasizes the importance of data collection and implementation into long-term datasets in order to better evaluate the condition of the ACT Basin over time. Developing research and monitoring efforts is important due to the lack of information in the ACT Basin. Research of water quality parameters throughout the year and at varying drought conditions, flow variables which are important to aquatic species, erosion rates downstream of dams, species status surveys, connectivity of mainstem rivers to tributaries and floodplains, fish passage, and impacts of reservoir levels on game species is needed to properly manage the ACT Basin. Collaboration and partnership support is crucial for obtaining the needed information. Monitoring conditions in the ACT Basin will identify basin responses to operations and will allow us to make the proper changes for watershed improvement. To protect trust resources we must be adaptive in our strategy to address past, present, and future threats to the ACT Basin.

LITERATURE CITED

Allan, J. D. 1995. Stream ecology: Structure and function of running waters. Chapman and Hall, London. pp. 46, 73.

Atkins, J. B, H. Zappia, J. Robinson, A. McPherson, R. Moreland, D. Harned, B. Johnston, and J. Harvill. 2004. Water quality in the Mobile River Basin, Alabama, Georgia, Mississippi, and Tennessee, 1999-2001: U.S. Geological Survey, Circular 1231. 40 pp.

Clean Water Act (CWA) Section 401 Water Quality Certification (WQC). 2011. Alabama Department of Environmental Management, December 2010. http://adem.alabama.gov/programs/water/401cert.cnt

Dinkins, G. and M. Hughes. 2011. Freshwater mussels (Unionidae) and aquatic snails of selected reaches of the Coosa Drainage, Georgia. Dinkins Biological Consulting, LLC, Powell, TN. 85 pp.

Federal Energy Regulatory Commission. 2009. Project Docket Number 13159: Application of Lock+™ Hydro Friends Fund XIX, LLC for a Preliminary Permit for Project Steel curtain, Claiborne Lock and Dam, Monroeville, AL. Hydro Green Energy. June 2009. 15 pp.

Freeman, M., M. Hagler, B. Albanese, and B. Freeman. 2011. Inventory of small-bodied fishes and their habitat below two United States Army Corps of Engineers hydropower facilities in the Upper Coosa Watershed. U.S. Geological Survey, Athens, Georgia, unpublished. 38 pp.

Garner, J., M. Buntin. 2011. Quantitative sampling of *Pleurobema taitianum* in the Alabama River. Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Fisheries Section. 7 pp.

Garner, J., M. Buntin, T. Fobian. 2011. Survey for *Tulotoma magnifica* in Mainstem of Alabama River. Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Fisheries Section. 22 pp.

Godwin, J. 2011. Burrow occupancy of the Red Hills salamander at Haines Island Park and survey for populations west of the Alabama River. Alabama Natural Heritage Program. 31 pp.

Johnson, P. 2010. Proposed reintroduction of the Interrupted Rocksnail, *Leptoxis foremani* (Lea, 1843), in the Coosa River near Centre, Cherokee County, Alabama. Alabama Department of Conservation and Natural Resources, August 2010. 11 pp.

Johnston, C., H. Haley. 2011. Fish assemblage survey of selected sites in the Alabama River and associated tributaries. Auburn University, Auburn, AL. 45 pp.

Mettee, M., P. O'Neil, T. Shepard, and S. McGregor. 2005. A study of fish movements and fish passage at Claiborne and Millers Ferry Locks and Dams on the Alabama River, Alabama: Alabama Geological Survey open-file report. Tuscaloosa, AL. 32 pp.

Mobile River Basin Mollusk Restoration Committee. 2010. A Plan for the Population Restoration and Conservation of Freshwater Mollusks of the Mobile River Basin. 103 pp.

National Weather Service. 2011. Advanced Hydrologic Prediction Service: Etowah River near Cartersville, Coosawattee River near Redbud, Alabama River at R.F. Henry L&D, Alabama River near Millers Ferry, and Alabama River near Claiborne. October 2011. <http://www.srh.noaa.gov/serfc/>

Poff, L., and J. Ward. 1990. Physical habitat template of lotic systems: Recovery in the context of historical pattern of spatiotemporal heterogeneity. Environmental Management 14:629-645.

Richter, B., J. Baumgartner, J. Powell, and D. Braun. 1996. A method for assessing hydrologic alteration within ecosystems. Conservation Biology 10: 1163-1174.

Rider, S. 2011. Evaluating techniques to pass migratory fishes in the Alabama and Cahaba Rivers using navigational lock chambers. Alabama Department of Conservation and Natural Resources, Division of Wildlife and Freshwater Fisheries, Fisheries Section. 6 pp.

Simcox, B., D. DeVries, and R. Wright. 2011. Re-establishing fish migration pathways: Feasibility of passing fish through two Alabama River lock structures. Auburn University, Auburn, Alabama. American Fisheries Society 141st Annual Meeting, Seattle, Washington. September 4-8.

Schotz, A. 2011. Inventory of federally listed and sensitive plant and select animal species on U.S. Army Corps of Engineers landholdings along the Alabama River. Alabama Natural Heritage Program, Final Report, June 2011. 18 pp.

Tennessee Valley Authority. 2012. Reservoir releases improvements: Boosting Oxygen Concentrations. January 2012. <http://www.tva.gov/environment/water/rri_oxy.htm>

U.S. Army Corps of Engineers. 2005. Project Operations, Reservoir regulation and coordination for fish management purposes. Mobile District SOP 1130-2-9, draft. February 2005. 5 pp.

U.S. Army Corps of Engineers. 2011. ACT Water Control Manual Update: Response to USFWS Planning Aid Letter dated May 3, 2010. U.S. Army Corps of Engineers, Mobile District. June 2011. 62 pp.

U.S. Army Corps of Engineers. 2012. Level of Service; USACE change lock hours of operation. U.S. Army Corps of Engineers, Mobile District. October 9, 2012. < http://www.sam.usace.army.mil/Media/NewsReleases/tabid/6473/Article/5013/level-of-service-usace-change-lock-hours-of-operation.aspx>

U.S. Fish and Wildlife Service. 2000. Mobile River basin aquatic ecosystem recovery plan. Atlanta, GA. 128 pp.

U.S. Fish and Wildlife Service. 2004. Endangered and threatened wildlife and plants; designation of critical habitat for three threatened mussels and eight endangered mussels in the Mobile River Basin; final rule. Federal Register, Vol. 69, No. 126: 40084-40171.

U.S. Fish and Wildlife Service. 2006. Aquatic Resource Management Plan for the Alabama River Basin. U.S. Fish and Wildlife Service, Daphne, AL. 124 pp.

U.S. Fish and Wildlife Service. 2010. Effects of Allatoona Dam on Etowah River temperatures in June 2009: Modeled effects and actual measurements. Georgia Ecological Services, Athens, GA. 12 pp.

U.S. Fish and Wildlife Service. 2010. Planning Aid Letter regarding the Alabama-Coosa-Tallapoosa Water Control Manual Updates. U.S. Fish and Wildlife Service, Daphne, AL. 42 pp.

APPENDICIES

- Corps' Federal Register Notice of Intent, November 9, 2007, Intent To Prepare Draft Environmental Impact Statement for Revised Water Control Manuals for the Alabama-Coosa-Tallapoosa River Basin. Vol. 72, No. 217 (Appendix I);
- Service's October 20, 2008, Scoping Letter to the Corps (Appendix II);
- Service's May 3, 2010, PAL to the Corps (Appendix III);
- Service's August 13, 2010, Supplement to PAL to the Corps (Appendix IV);
- Corps' June 6, 2011, response to the Service's PAL (Appendix V); and
- Corps' November 22, 2011, response to the Service's questions regarding the Corps' June 6, 2011 document (Appendix VI).

Appendix I: Corps' Federal Register Notice of Intent, November 9, 2007, Intent To Prepare Draft Environmental Impact Statement for Revised Water Control Manuals for the Alabama-Coosa-Tallapoosa River Basin. Vol. 72, No. 217.

TABLE 1. SUMMARY OF HMS EXEMPTED PERMITS ISSUED IN 2006 AND 2007. AHMS@ REFERS TO MULTIPLE SPECIES BEING COLLECTED UNDER A GIVEN PERMIT TYPE.—Continued

	2006					2007		
	Number of Permits Issued	Number of Authorized Fish	Number of Authorized Larvae	Number of Fish Taken	Number of Larvae Taken	Number of Permits Issued	Number of Authorized Fish	Number of Authorized Larvae
Billfish	3	179	0	57	0	2	73	1,000
SRP								
HMS	4	485	1,200	2	0	1	18	0
Shark	2	400	0	284	0	2	670	0
Billfish	1	0	500	0	0	0	0	0
Tuna	0	0	0	0	0	1	12	0
Display								
HMS	1	89	0	2	0	2	90	0
Shark	7	505	0	89	0	6	266	0
Total	39	3,973	1,700	850	0	31	2,503	1,000
LOA*								
Shark	5	2,853	0	1,021	0	7	3,120	0

*LOAs are issued for bonafide scientific research activities involved non-ATCA managed species (i.e., sharks). Collections made under an LOAs are not authorized; rather this estimated harvest for research is acknowledged by NMFS. Permitees are encouraged to report all fishing activities in a timely manner.

Final decisions on the issuance of any EFPs, SRPs, Display, and Chartering Permits will depend on the submission of all required information about the proposed activities, NMFS' review of public comments received on this notice, an applicant's reporting history on past permits issued, past law enforcement violations, consistency with relevant NEPA documents, and any consultations with appropriate Regional Fishery Management Councils, states, or Federal agencies. NMFS does not anticipate any significant environmental impacts from the issuance of these EFPs as assessed in the 1999 FMP.

Authority: 16 U.S.C. 971 *et seq.* and 16 U.S.C. 1801 *et seq.*

Dated: November 1, 2007.

Emily H. Menashes,

Acting Director, Office of Sustainable Fisheries, National Marine Fisheries Service.

[FR Doc. E7–22071 Filed 11–8–07; 8:45 am]

BILLING CODE 3510–22–S

DEPARTMENT OF DEFENSE

Department of the Army; Corps of Engineers

Intent To Prepare Draft Environmental Impact Statement for Revised Water Control Manuals for the Alabama-Coosa-Tallapoosa River Basin

AGENCY: Department of the Army, U.S. Army Corps of Engineers, DoD.

ACTION: Notice of intent.

SUMMARY: The U.S. Army Corps of Engineers (Corps), Mobile District, intends to prepare an update of the water control manuals for the Alabama-Coosa-Tallapoosa (ACT) River Basin. Concurrent with that revision, a Draft Environmental Impact Statement (EIS) will be prepared, as required by the National Environmental Policy Act (NEPA). The Draft EIS will address updated operating criteria and guidelines for managing the water storage and release actions of agency water managers and associated environmental impacts.

FOR FURTHER INFORMATION CONTACT: Questions about the manual update or NEPA process can be answered by: Mr. Chuck Sumner, Environment and Resources Branch, Planning Division, U.S. Army Engineer District-Mobile, Post Office Box 2288, Mobile, AL 36628–0001; Telephone (251)694–3857; or delivered by electronic facsimile at (251) 694–3815; or E-mail: lewis.c.sumner@usace.army.mil. You may also request to be included on the mailing list for public distribution of notices, meeting announcements and documents.

SUPPLEMENTARY INFORMATION:

Background. Water control manuals are guidance documents that assist federal water managers in the operation of individual and multiple interdependent federal reservoirs on the same river system. They provide technical, historical, hydrological, geographic, demographic, policy and other information that guide the proper management of reservoirs during times of high water, low water, and normal conditions. The manuals also contain drought plans and zones to assist federal water managers in knowing when to reduce or increase reservoir releases, and how to ensure the safety of dams during extreme conditions. The authority and guidance for the Corps to prepare and update these manuals may be found in Section 7 of the 1944 Flood Control Act, the Federal Power Act, Section 9 of Public Law 436–83, and the following Corps of Engineer Regulations: ER 1110–2–240, ER 1110–2–241, ER 1110–2–1941 and ER 1110–2–8156.

The ACT Basin provides water resources for multiple purposes from northwestern GA down through central AL and to the Gulf Coast at the mouth of Mobile Bay, extending a distance of approximately 320 miles and encompassing an area of approximately 22,800 square miles. The master operating manual for the ACT River Basin and the individual reservoir manuals were last updated at various dates as far back as the early 1950's. Sixteen major dams and reservoirs (five Federal and eleven non-Federal) are located in the basin. In Georgia, these include Allatoona Dam and Lake, and Carters Dam and Lake, both owned and operated by the Corps. In Alabama they include Weiss Dam and Lake, H. Neely Henry Dam and Lake, Logan Martin Dam and Lake, Lay Dam and Lake, Mitchell Dam and Lake, Walter Bouldin Dam and Lake, Jordan Dam and Lake, Harris Dam and Lake, Martin Dam and Lake, Yates Dam and Lake, and Thurlow

Dam and Lake, all owned and operated by Alabama Power Company (APC). Also in Alabama, are three dams and reservoirs owned and operated by the Corps including Jones Bluff Dam/Woodruff Lake, Millers Ferry Dam/William "Bill" Dannelly Lake and Claiborne Dam and Lake. The authorized project purposes at the Corps lakes include water supply, flood control, hydropower, navigation, fish and wildlife conservation, and recreation.

The new manuals will eventually replace the current manuals and will address the basin-wide management of those water resources. Due to the flood control operational responsibilities of the Corps, some or all of the manuals for some of the APC reservoirs will be updated.

Public participation throughout the water control plan revision process is essential. The Corps invites full public participation at all stages to promote open communication and better decision making. All persons, stakeholders, and organizations that have an interest in water-related resources in the ACT basin, including minority, low-income, disadvantaged and Native American groups, are urged to participate in this NEPA environmental analysis process. Assistance will be provided upon request to anyone having difficulty understanding how to participate. Dates and locations for public scoping meetings will be announced by future publication in the **Federal Register** and in the local news media. Tentative dates for publication of the draft water control manuals and EIS and other opportunities for public involvement will also be announced at that time. Public comments are welcomed anytime throughout the NEPA process.

Cooperating Agencies. The lead responsibility for this action rests with the Corps. The Corps intends to coordinate and/or consult with an interagency team of Federal and State agencies during scoping and preparation of the draft EIS. A decision will be made during the scoping process whether other agencies will serve in an official role as cooperating agencies.

Scoping. The Alabama-Coosa-Tallapoosa Rivers (ACT)/Apalachicola-Chattahoochee-Flint Rivers (ACF) Comprehensive Study from 1990 to 1997 and ACF Compact negotiations from 1997 to 2004 involved the States (Alabama, Florida and Georgia), stakeholders and the public in identifying areas of concern; collecting and developing water resource, environmental, and socioeconomic data; and developing tools to assist in decisions affecting water resources within the two basins. Development of the updated water control manuals and scoping for this EIS will continue to build upon the knowledge and information developed during the Comprehensive Study and subsequent Compact negotiations. Scoping meetings with agencies and stakeholder groups will be scheduled to identify any significant issues and data gaps, focus on the alternatives to be evaluated, and to identify any appropriate updated tools to assist in evaluation of alternatives and analysis of impacts.

Byron G. Jorns,
Colonel, Corps of Engineers, District Commander.

[FR Doc. E7–22043 Filed 11–8–07; 8:45 am]

BILLING CODE 3710–CR–P

DEPARTMENT OF DEFENSE

Department of the Navy

Notice of Intent To Prepare an Environmental Impact Statement for Access Between the Laurelwood Housing Area and an Adjacent State Primary or Secondary Road at Naval Weapons Station Earle, Colts Neck, NJ and To Announce a Public Scoping Meeting

AGENCY: Department of the Navy, DoD.

ACTION: Notice.

SUMMARY: Pursuant to section (102)(2)(c) of the National Environmental Policy Act (NEPA) of 1969, and the regulations implemented by the Council on Environmental Quality (40 CFR Parts 1500–1508), the Department of the Navy (Navy) announces its intent to prepare an Environmental Impact Statement (EIS) to evaluate the potential environmental consequences of providing access between the Laurelwood housing area at Naval Weapons Station (NWS) Earle and an adjacent state primary or secondary road. The requirement for this access in 2010 is a stipulation within the lease agreement between the Navy and the developer of Laurelwood. This developer may construct necessary road improvements to obtain access and rent any housing units to the general public through the year 2040.

Dates and Addresses: Public scoping will be conducted in the form of an open-house style meeting to be held in Monmouth County, New Jersey to receive written comments on environmental concerns that should be addressed in the EIS. The public scoping meeting will be held on November 27, 2007, from 4 p.m. and 8 p.m., at Brookdale Community College, 765 Newman Springs Road, Lincroft, New Jersey.

FOR FURTHER INFORMATION CONTACT: Mr. Patrick Fisher, Naval Weapons Station Earle, Public Affairs Officer, 201 Highway 34 South, Building C–2, Colts Neck, New Jersey 07722; telephone: 732–866–2171; e-mail: *patrick.l.fisher@navy.mil.*

SUPPLEMENTARY INFORMATION: The proposed action is to provide unimpeded access in the year 2010 to the developer of the Laurelwood housing area across a portion of mainside NWS Earle connecting the Laurelwood housing area with a state primary or secondary road. The requirement for this access in 2010 is part of an existing lease agreement between the Navy and the developer of Laurelwood.

In 1988 the Navy contracted with a developer to construct, own, and operate 300 military family housing units at NWS Earle, now known as the Laurelwood housing area. A 52-year lease agreement for the underlying land was executed between the Navy and the developer which included an in-lease and out-lease period. During the in-lease period, which runs from 1988 until 2010, the Navy guarantees rent payments to the developer for the occupancy of all 300 Laurelwood units. Only military and their dependents are allowed to occupy these housing units during the in-lease period. During the out-lease period of 2010 until 2040 the developer may rent the units to the general public. However, the lease requires that the Navy provide "reasonable access" between the Laurelwood housing area and an adjacent State, primary, or secondary road. The lease agreement defines reasonable access as being on a paved road, constructed, operated, and maintained by the developer at its own cost. The Navy may satisfy this obligation by either (a) providing unimpeded access along existing roads of the installation or (b) providing an easement for alternate access adequate to allow the developer to construct a road from an adjacent primary or secondary road to Laurelwood that will provide unimpeded access. Road construction would be subject to Federal, State and local laws and regulations. While the developer must pay for construction of a new road and necessary improvements, the Navy is required to finance the construction of any road enhancements necessary to meet their security or operational requirements (*e.g.*, security fencing, gates). In addition, the Navy is required

Appendix II: Service's October 20, 2008, Scoping Letter to the Corps.

Colonel Byron G. Jorns
District Engineer
Att: Chuck Sumner
U.S. Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, AL 36628-001

Dear Col. Jorns:
Thank you for the opportunity to participate in the scoping process regarding the review and updating of the Water Control Manual (WCM) for the Alabama-Coosa-Tallapoosa (ACT) River Basin, as announced in the November 9, 2007 Federal Register. We are providing the following comments in accordance with the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. et seq.) and the Endangered Species Act of 1973 (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.).

Outlined below are a number of issues we have identified that should be addressed in the update to the WCM.

Threatened and Endangered Species - There are at least 12 extant federally listed species found in mainstem river reaches of the ACT that have the potential to be affected by reservoir operations. These include:

Alabama sturgeon	*Scaphirhyncus suttkusi*	Endangered
Gulf sturgeon	*Acipenser oxyrinchus desotoi*	Threatened
Goldline darter	*Percina aurolineata*	Threatened
Tulotoma snail	*Tulotoma magnifica*	Endangered
Inflated heelsplitter	*Potamilus inflatus*	Threatened
Heavy pigtoe	*Pleurobema taitianum*	Endangered
Southern clubshell	*Pleurobema decisum*	Endangered
Triangular kidneyshell	*Ptychobranchus greenii*	Endangered
Fine-lined pocketbook	*Hamiota altilis*	Threatened
Interrupted rocksnail	*Leptoxis foremani*	Candidate
Rough hornsnail	*Pleurocera foremani*	Candidate
Wood stork	*Mycteria americana*	Endangered

You should also consider the federally listed species found in tributary streams and nearby terrestrial habitats of the ACT basin that have the potential to be impacted by reservoir operations. These include:

Painted rocksnail	*Leptoxis taeniata*	Threatened
Cylindrical lioplax	*Lioplax cyclostomaformis*	Endangered
Lacy elimia	*Elimia crenetella*	Threatened

Blue shiner	*Cyprinella caerulea*	Threatened
Georgia rockcress	*Arabis georgiana*	Candidate
Price's potato-bean	*Apios priceana*	Threatened
AL canebrake pitcher-plant	*Sarracenia rubra alabamensis*	Endangered
Kral's water-plantain	*Sagittaria secundifolia*	Threatened
Harperella	*Ptilimnium nodosum*	Endangered
Georgia aster	*Symphyotrichum georgianum*	Candidate
Tennessee yellow-eyed grass	*Xyris tennesseensis*	Endangered
Mohr's Barbara's buttons	*Marshallia mohrii*	Threatened
Alabama leather-flower	*Clematis socialis*	Endangered
Green pitcher-plant	*Sarracenia oreophila*	Endangered

Note that Georgia rockcress, Georgia aster, and Price's potato-bean have been found on or near river bluffs overlooking mainstem ACT rivers and reservoirs.

Critical habitat for 10 species of mussels has also been designated in 14 units, or stream segments, located throughout the ACT basin. These mussels include:

Southern acornshell	*Epioblasma othcaloogensis*	Endangered
Ovate clubshell	*Pleurobema perovatum*	Endangered
Southern clubshell	*Pleurobema decisum*	Endangered
Upland combshell	*Epioblasma metastriata*	Endangered
Triangular kidneyshell	*Ptychobranchus greenii*	Endangered
Alabama moccasinshell	*Medionidus acutissimus*	Threatened
Coosa moccasinshell	*Medionidus parvulus*	Endangered
Southern pigtoe	*Pleurobema georgianum*	Endangered
Fine-lined pocketbook	*Hamiota altilis*	Threatened
Orange-nacre mucket	*Hamiota perovalis*	Threatened

Critical habitat has been proposed for the Alabama sturgeon (*Scaphirhyncus suttkusi*). Because many of these species are isolated and fragmented from reservoir development and water quality conditions, we encourage the Corps to participate with Federal and State agencies to develop a comprehensive monitoring plan to identify any remaining unknown or historically known populations in the basin.

The U.S. Fish and Wildlife Service, working with State, Federal, non-government and private business partners, also has identified potential re-introduction sites for recovery of listed aquatic species within the ACT basin; we would like to enlist the Corps as a partner in this large-scale recovery effort (see O'Neil et. al 2008). As work on the WCM update proceeds, please contact Dan Everson of the Alabama Field Office for the most up-to-date list of federally listed species, critical habitat, and their locations in the ACT basin, as well as potential sites for re-introduction of listed species. In addition to aquatic recovery efforts, we would like the Corps to consider terrestrial habitats under their ownership as potential locations for outplanting of federally listed plants should the need and opportunity arise.

Species of Greatest Conservation Need - In an effort to keep more species from becoming imperiled to the point of requiring federal listing under the Endangered Species Act (ESA), the Alabama Department of Conservation and Natural Resources has identified Species of Greatest Conservation Need (GCN) in the state; several of these are found within the ACT basin. The spotted rocksnail (*Leptoxis picta*), at least 2 species of mussels (painted clubshell, *Pleurobema chattanoogaense;* southern purple lilliput, *Toxolasma corvunculus*) and one species of fish (Alabama shad, *Alosa alabamae*) are found in mainstem ACT rivers. GCN bird species considered to be of high conservation concern that utilize wetlands and floodplain forests in interior Alabama include the least bittern (*Ixobrychus exilis*), American black duck (*Anus rubripes*), swallow-tailed kite (*Elanoides forficatus*), yellow rail (*coturnicops novaboracensis*), American woodcock (*Scolopax minor*) and the Swainson's warbler (*Limnothlypis swainsonii*). The update to the Corps' WCM should address the potential of Corps reservoir operations to impact species that may be on the brink of requiring federal protection under the ESA.

Fish and Aquatic Organism Passage - Dams on the Alabama River have blocked historic migrations of more than a dozen species of fish for several decades, and have contributed to the decline of the critically imperiled Alabama sturgeon. High flows that overtop the dams and opening of dam locks at Claiborne and Miller's Ferry have been identified as methods to facilitate aquatic organism passage on the Alabama River. We recommend that the Corps continue to facilitate research on fish passage at Corps dams on the ACT, including research on timing and duration of attraction flows, monitoring and tracking of species through the lock and dam structures, and "dummy" locking, with the goal of implementing Corps reservoir operations that allow riverine species to travel their historic migration pathways.

Water Quality - The effect of reservoir operations on water quality should be addressed in the WCM update, including existing and potential effects to dissolved oxygen, temperature, pH, conductivity, nutrient and organic material dynamics, and various industrial and municipal discharges. A monitoring program addressing water quality in reservoirs and tailwaters should be designed and implemented to detect, report and mitigate water quality issues that may impact benthic and pelagic species.

Flow Dynamics - A number of natural flow regime components (e.g., base, seasonal, and minimum/maximum flow levels, frequency/duration of low/high pulse flows, flow rise/fall rates and frequency of flow reversals) are important, even critical, to the long-term maintenance and protection of the basin's riverine fauna and habitats. These natural flow characteristics can provide a template for management strategies at water control facilities, as well as for future water management changes that may result from a basin-wide allocation formula. We recommend that the conservation and/or recovery of as many of these natural flow conditions as possible be fully considered in the development and implementation of the new water control manual for the ACT basin. In Alabama, the effects to downstream aquatic biota and riverine ecology from diurnal hydropower peaking flows from the RF Henry and Miller's Ferry dams, which are often described as run-of-the-river dams, should be examined.

Riparian and Wetland Habitats - The ecological integrity of riverine systems is intimately connected to the quality and quantity of streamside floodplain forests and wetlands. The review and updating of the WCM should address effects to the vegetation ecology of adjacent wetlands and floodplain forests, as well as the wildlife resources dependent upon them including migratory birds. The federally endangered wood stork (*Mycteria americana*) relies on the shallow wetland areas adjacent to the Alabama River during the summer and fall each year for foraging.

Technical Working Group for Water Modelers - To facilitate information sharing and involvement with the WCM update process, we recommend that a technical working group of water modelers from interested stakeholders familiar with the HEC-ResSim Reservoir Simulation be formed and meet on a regular basis during and after the completion of the WCMs.

Integrated Drought Plan - The Water Control Manual update should integrate a basin-wide drought plan that addresses water allocation issues among stakeholders in Georgia and Alabama, as well as the operation of dams operated by Alabama Power Company on the Coosa and Tallapoosa Rivers. A drought plan should adequately identify water quality and quantity needs at various times of the year.

Please address questions and comments on the Water Control Manual update process to Dan Everson (251-441-5837) of my staff.

Sincerely,

William Pearson
Field Supervisor
Alabama Ecological Services Field Office

cc: Sandy Tucker, USFWS Ecological Services, Athens, GA
Stan Cook, AL Dept. of Conservation and Natural Resources, Montgomery, AL
Jeff Weller, USFWS R4 Regional Office, Atlanta, GA

References

O'Neil, Patrick E., S.W. McGregor, E. A. Wynn, and J.R. Powell, 2008. Critical habitat Units for threatened and endangered mussels in the Mobile River Basin. Geological Survey of Alabama Special Map 247.

Appendix III: Service's May 3, 2010, PAL to the Corps.

Colonel Byron Jorns
US Army Corps of Engineers, Mobile District
P.O. Box 2288
Mobile, AL 36628-0001

Subject: Planning Aid Letter regarding the Alabama-Coosa-Tallapoosa Water Control Manual Updates

Dear Colonel Jorns:

We are providing your agency with a Planning Aid Letter (PAL) for the proposed Water Control Manual (WCM) Updates for the Alabama-Coosa-Tallapoosa (ACT) Basin in Georgia and Alabama. The purpose of the updates is to identify operating criteria and guidelines for managing water storage and release of water from U.S. Army Corps of Engineers (Corps) reservoirs. The resulting documents will guide water management operations. In the National Environmental Policy Act (NEPA) review, the Corps will address current operations, proposed changes in water management operations at the reservoir projects within the limits of the existing authorities, as well as potential impacts throughout the basin that would result from implementation of the updated manual.

The purpose of the PAL is to identify resource values and issues, identify federally protected species issues, and propose preliminary changes, mitigation, or enhancement opportunities to facilitate your decision-making as it relates to equal consideration of fish and wildlife resources. We submit the following comments and recommendations under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. § 1531 *et seq*.), the Migratory Bird Treaty Act (MBTA)(49 Stat. 755, as amended; 16 U.S.C. § 702 *et seq*.), and the Fish and Wildlife Coordination Act (FWCA) (48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq*.). These comments are based on previous studies and government documents as well as new datasets and information provided by State and Federal agencies. Continued efforts will be made to provide additional expertise and information in the form of another PAL and/or the draft FWCA reports. A separate consultation will occur regarding the potential impacts of the Corp's proposal on federally-listed threatened and endangered fish and wildlife species protected under the ESA. We stress that in the following letter, our recommendations are preliminary. Monitoring of many important ecological parameters in the ACT following dam construction has been limited. Unfortunately, even 40 years after construction we lack critical data on the dissolved oxygen levels above and below Corps reservoirs, as well as effects of hydropower peaking flows on fish assemblages. New information often changes our understanding of ecological response to complex natural and human-influenced variables. Rather than attempt, in one document, to prescribe definitive management guidelines for possibly decades of dam operations, we would like to begin working with the Corps to build an adaptive management framework for operations that explicitly outlines goals and objectives of operations, continually monitors and analyzes ecosystem response, and adjusts operations accordingly based on what we have learned. Adaptive management of river systems helps to link the resistance and resilience of species and ecosystems to a natural range of flow variation. Management should occur over a geographic area large enough that most species' habitat requirements will be met somewhere, though not necessarily at the same location every year (Sparks 1998). Necessarily we will recommend research and monitoring as a primary component of dam operations.

1.0 PRIOR STUDIES OR REPORTS

A complete review of the many reports, analyses, lawsuits, and volumes of data associated with water management in the ACT is beyond the scope of this report, but we will reference several documents in this PAL that are important to management of fish and wildlife resources.

The US Fish and Wildlife Service (Service) previously made available a list of federally protected species and other species of concern in 2008 as part of the initial scoping for this project. Since then, critical habitat has been designated for the Alabama sturgeon in the Alabama and Cahaba Rivers (USFWS 2009). The rough hornsnail and interrupted rocksnail have been proposed for listing, and there is a proposal to designate critical habitat for them below Jordan Dam. Revisions to this list will continue to be provided as necessary as the draft and final FWCA reports are developed.

A Service recovery plan for federally listed aquatic species in the Mobile River Basin was completed in 2000, and had input from many partners in the basin including the Corps. The recovery plan outlines many of the issues that must be addressed to protect species that are listed under the ESA(USFWS 2000). Because the system of dams operated by the Corps has a significant influence on habitat availability and suitability in the ACT, an update to the WCMs for these dams has the potential to provide significant benefits for these species, as well as many other species not protected under the ESA.

2.0 GENERAL DESCRIPTION OF FISH AND WILDLIFE RESOURCE CONDITIONS

Aquatic resources within the ACT basin are heavily impacted by human development, including the construction and operation of dams, channelization, and dredging and water quality degradation (USFWS 2000, 2006; Atkins et al. 2004). Cumulatively, these activities are physically degrading habitats, decreasing or eliminating natural variability of water flows, and fragmenting populations of many aquatic organisms.

Dams constructed for hydropower generation, navigation, flood control, water supply, and recreation have impounded about 600 river miles of aquatic habitat in the ACT Basin (USFWS 2000), including more than 230 miles impounded by Corps dams (USACE 1998). Impoundments and flow regulation have induced changes in aquatic habitats by altering sediment deposition, flow patterns, rates of geomorphic channel adjustment, and water quality conditions throughout the river system. Dams also function as barriers to aquatic species movement. Consequently, many native species are extinct or extirpated from significant portions of the ACT Basin as a direct or indirect result of dam construction. (Bogan et al. 1995; USFWS 2000).

Channelization has occurred within every major river system within the ACT (USACE 1990, USFWS 2000). Activities for straightening, deepening, and/or enlarging stream and river channels were particularly concentrated in the Alabama River portion of the drainage (USACE 1990). The effects of channelization on aquatic habitats include loss of habitat diversity, substrate stability, and riparian canopy; accelerated bed and bank erosion; and altered depth (Brooks 1994). While channel dredging diminished in recent years, continued geomorphic response to channelization is manifested through channel erosion, channel filling, and headcutting (USFWS 2000).

Dredging to support vessel navigation in the Alabama River initially involved removal of shallow shoals and other historic aquatic habitats for species that are now imperiled (USFWS 2000). This removal destroyed benthic organisms and their habitats, eliminated habitat and prey for fishes and turtles, initiated and perpetuated upstream instability and erosion, and increased downstream turbidity (USFWS 2000). Initial habitat losses were severe, whereas current maintenance dredging and spoil disposal of seasonally accumulated sediments is thought to have less of an impact, only because many sensitive species have already been eliminated, and surviving species are distributed according to current patterns of deposition and erosion (Hartfield and Garner 1998).

The following sections will discuss several of the important issues that should be addressed in evaluating operational parameters in the Corps' updating of the WCMs for dams of the ACT Basin. This will be followed by a reach-by-reach discussion of fish and wildlife-related issues

2.1 Instream Flow

With the updates to the WCM, the Corps has an opportunity and obligation to help restore and/or maintain instream flows that provide habitat for all life stages of aquatic species (adult feeding, spawning, egg and larval survival, and nursery and rearing habitat). Instream flows are also necessary to enable migration of anadromous, catadromous, potadromous, and riverine fish over and around barriers (including necessary attraction flows for fishways), and to provide water quality to sustain biota and high quality habitats.

We recognize the operational constraints to achieving environmental flow objectives imposed by the many competing uses for water in Alabama and Georgia. However, opportunities still exist for providing flows for bypassed natural river channels downstream of hydropower projects, adjusting flows in highly regulated river sections downstream of hydropower dams, providing non-peaking flow windows during critical spawning periods, and providing adequate flows for water quality maintenance in water segments that have experienced species die-offs.

A number of natural flow regime components (e.g., base, seasonal, and minimum/maximum flow levels, frequency/duration/timing of low/high pulse flows, flow rise/fall rates and frequency of flow reversals) are important, even critical, to the long-term maintenance and protection of the basin's riverine fauna and habitats. These natural flow characteristics can provide a template for management strategies below Corps dams, as well as for future water management changes that may result from a basin-wide allocation formula. The frequency and magnitude of channel forming flows (generally high flows with a 1 to 2-year return interval) are important for maintaining natural rates of geomorphic change and habitat maintenance (Dunne and Leopold 1978). We recommend that conservation and/or recovery of as many of these natural flow regime components be fully considered in the development and implementation of the new WCM for the ACT basin.

Flow regulation has negatively affected biota and habitat throughout the basin. The effects to downstream aquatic biota and riverine ecology from daily hydropower peaking flows from the RF Henry and Miller's Ferry dams, which are often described as run-of-the-river dams, should be examined. The diversion of flows from a portion of the Coosa River near Weiss Reservoir caused desiccation of habitats and extirpation of multiple species. Hydropower peaking flows are also experienced by the aquatic organisms in the Etowah River below Allatoona Dam in Georgia. By design the Carters Reregulation Dam largely eliminates peak flow pulses from the Carters Reservoir Project, but the two dams comprising the project still eliminate much of the natural flow variability of the Coosawattee River, particularly the high flow component.

Thorough explanations of the physical, chemical, and ecological benefits from base flows, pulses, stable flow windows for spawning, and intra- and interannual flow variation are outside the scope of this letter; however we refer the reader to Junk et al 1989, Poff et al. 1997, Richter et al. 1998, Freeman et al. 2001, Postel and Richter 2003, and Mathews and Richter 2007 for fuller descriptions. The importance of baseflows, pulses, and flood flows are described within these resources.

In the middle portion of the ACT Basin, instream flow recommendations for re-licensing of hydropower dams owned by Alabama Power Company (APC) have largely followed the framework developed by the joint U.S. Environmental Protection Agency (EPA)/Service *Instream Flow Guidelines for the ACT* (Alabama-Coosa-Tallapoosa) *and ACF* (Apalachicola-Chattahoochee-Flint) *Basins Interstate Water Allocation Formula* (USFWS/EPA 1999). These flow regime guidelines are based on the principle that ecosystems evolved as a response to the natural flow regime, and that restoration of some natural flow regime components can restore structural and functional ecosystem elements that were lost or reduced as a consequence of flow regulation. Since the development of the 1999 flow guidelines, new flow analysis tools have been developed that facilitate more comprehensive descriptions of flow regimes and flow recommendations. One such tool is the Environmental Flow Components (EFCs) in Indicators of Hydrologic Alteration (IHA, Mathews and Richter 2007).

EFCs were used by the Service to develop flow guidelines for the ACF PAL for the WCM update, and for this PAL, we advocate the Corps follow a similar approach.

We recommend that water management in the ACT Basin, to the extent possible, be coordinated from headwaters to delta using methods and tools available in the resources cited in this section. This will require continued significant coordination with APC as well as State water resource agencies.

2.2 Water Quality

Water quality below several Corps dams, including Millers Ferry and Allatoona, does not meet State water quality standards. With the update to the WCM, the Corps has an opportunity and obligation to help maintain, restore, and/or enhance adequate water quality for the support of all life stages of aquatic species in the ACT Basin. Monitoring by the Alabama Department of Environmental Management (ADEM) in the summers of both 2008 and 2009 in several sections of the Alabama River indicated that dissolved oxygen levels occasionally dropped below 4.0 mg/L for several hours in the main channel, and on a few occasions dropped below 3.0 mg/L (ADEM preliminary datasonde data, 2008-2009). Data collected by the Service in the summer of 2009 on the Etowah River below Allatoona Reservoir indicated DO levels lower than 1.0 mg/L. (Figure 4). Low DO is a pervasive summer problem that needs to be addressed.

Water quality in all reaches needs to be adequate for successful reproduction and recruitment, as well as sustained growth of adults and juveniles (Watters 2000). DO and water temperature problems associated with inadequate instream flows, hypolimnetic discharges, stratification, and/or other causative reservoir discharge problems (e.g., the transport of pesticides, nutrients, biological/chemical oxygen demand-BOD/COD, and metals) should be identified and corrected at Corps dam facilities. Monitoring of water quality parameters to determine if ecological needs are met should be standard practice in dam operations, and ecological response to water quality changes should also be monitored.

2.3 Habitat Protection

The Corps has an opportunity and responsibility to protect and restore important riverine and associated aquatic habitats, and avoid additional losses of mainstem riverine habitat resulting from dam operations. These habitats include river bottoms, especially those supporting important structural and/or substrate features, shorelines, riparian zones, impacts from changing land uses, and associated wetland systems that serve as fish habitat and/or provide water quality and/or riverine morphological support functions.

Significant river-dependent habitats include the rich floodplain forests of the Alabama River, as well as the world-class wetlands and bottomland habitats of the Mobile-Tensaw Delta and Mobile Bay. Forest and grassland communities within the zone of annual, decadal and multi-decadal fluvial processes, including such disturbances as flooding and bank sloughing, are often distinctly different than communities outside that impact zone. Naturally, general moisture availability and the daily interaction between aquatic and terrestrial communities accounts for some of this unique riparian-zone character. However it’s equally apparent that the regular fluvial processes of deposition and erosion and a fluctuating water table, influenced greatly by Corps dams, play a significant role in mediating species success and dominance within those communities. Forest communities of the Alabama River bluffs also have acted as refugia and “species highways” for eons of climate change (Bill Finch, The Nature Conservancy, per. comm. 2010), suggesting that Corps infrastructure and land use related to water management in the ACT Basin can directly impact terrestrial forest community composition and persistence as well.

As a result of habitat fragmentation and population isolation, many of the aquatic species of federal and state concern will require population management and manipulation to maintain genetic flow between isolated populations, to reintroduce species to restored habitats, and, in some cases, prevent extinction. Priority sub-basins important for refugia and maintaining genetic flow are listed in the following document, as are the reaches designated as Critical Habitat as defined by the Service (USFWS 2004). We will also include reaches that have been identified as potential reintroduction/augmentation sites (Hartfield et al. 2010). To reestablish species in currently unoccupied habitats, it will likely be necessary to reintroduce animals through an active culture and propagation program. The Alabama Department of Conservation and Natural Resources (ADCNR), Division of Wildlife and Freshwater Fisheries, has established a state-of-the-art facility, the Alabama Aquatic Biodiversity Center (AABC), located at the former Claude Harris Federal Fish Hatchery in Marion, Alabama, dedicated exclusively to the culturing and propagation of non-game aquatic species. The Corps can help greatly in this undertaking by partnering with the AABC and utilizing their authority and resources to help protect and restore important aquatic habitats and flow regimes for species of concern in the ACT Basin.

Mitigation for loss of significant aquatic habitat, including inundation of over 40 miles of once free-flowing streams, has yet to be developed for the Carters Dam project in Georgia, completed in 1975. Mitigation for terrestrial and stream impacts for this project are long overdue, and should be addressed in the Draft Environmental Impact Statement (DEIS).

2.4 Aquatic Organism Passage

Fish passage facilities and structures are lacking on all Corps dams in the ACT, which has long been a concern of the Service. Downstream passage in particular can be facilitated by appropriate timing and volume of water releases over spillways and through locking chambers. The Corps has an opportunity to help restore and maintain connectivity of aquatic habitats in the ACT by developing and implementing safe and effective means for upstream and downstream passage.

Ongoing studies determining the effectiveness of using attraction flows and opening of lock gates to allow fish passage should continue, and may result in significant benefits for some species of fish. However, genetic isolation of aquatic organisms, further loss of native biotic diversity, and a trend toward environmental degradation is likely to continue as the landscape of the ACT Basin becomes more developed. We would like to see a cost benefit analysis comparing the operation and maintenance of the current navigational channel and system of locks and dams on the Alabama River versus the costs and economic benefits associated with maintaining the same system for maximum environmental benefits. We suggest that the DEIS at minimum should consider the alternative of operating locks to maximize connectivity of river reaches for aquatic organisms. A summary of the number of commercial barges and other craft that have and are currently utilizing the navigational system should be made available as part of the DEIS.

3.0 REACH DESCRIPTIONS

This section describes target resources present and historically present, objectives, and information needs for river reaches of the ACT in Alabama and Georgia.

3.1 Mobile Bay Delta to Claiborne Lock and Dam (L&D)

3.1.1 River Reach General Description

The lower 81-mile reach of the Alabama River from Claiborne L&D to its mouth flows entirely within the East Gulf Coastal Plain before joining the lower Tombigbee River to form the Mobile River and the biologically rich Mobile-Tensaw Delta. This reach drains an area of low-relief topography consisting of broad, rounded ridges and V-shaped valleys of sand and clay and is highly influenced by releases from upstream impoundments.

3.1.2 Species

Fishes: Alabama shad, Alabama and Gulf sturgeons, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, southern walleye, and ironcolor shiner are species of Federal/State interest that likely continue to inhabit this reach of the Alabama River (Mettee and Shepherd 2001; Mettee et al. 1996; Boschung and Mayden, 2004). However, populations of many of these species have been significantly impacted by Claiborne L&D that is blocking or hindering access to upstream spawning and feeding areas, particularly those species requiring long migrations to complete portions of their life cycle (e.g., Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Other freshwater species of sportfishing interest include the black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, this reach supported the Alabama moccasinshell, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, southern acornshell, southern combshell, southern pigtoe, stirrupshell, rayed creekshell, heavy pigtoe, Alabama pearlshell, black sandshell, tulotoma snail, cylindrical lioplax, painted rocksnail, and upland combshell. Recent dive records from numerous locations in this reach indicate that the inflated heelsplitter, heavy pigtoe, spotted rocksnail and tulotoma snail are the only target species surviving in this reach (USFWS Alabama Field Office data). Important commercial mussel beds also occur within this reach (Hartfield and Garner 1998).

Reptiles: The Alabama red-bellied turtle, alligator snapping turtle, and Mississippi diamondback terrapin are restricted to the lower reaches of the Alabama River in Baldwin County and the Mobile Bay/Delta, Patterns of natural flow variability created the ecologically-rich habitats where these species have survived for millennia.

Plants: Georgia rockcress occurs on the steep upper banks of this reach of the Alabama River, and may rely on flooding to help reduce competition from other vegetation (USFWS Alabama Field Office data). High flow events that scour river bluffs are likely beneficial to this plant.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.1.3 Objectives

Restore federally protected resident and migratory aquatic species to historic abundances in suitable remaining riverine habitats.

3.1.3.1 Instream flow

The flow regime in this reach is affected by peaking hydropower generation/flood control operations to some extent by the 15 upstream dams in the Alabama, Coosa and Tallapoosa Rivers, but a greater impact comes from the one or more pulse flows per day from hydropower peaking flows from Corps-operated turbines at Millers Ferry and R.F. Henry L&Ds (Braun 2004; see Figure 1). Operational guidelines for maintaining flows in this reach have largely focused on ensuring navigation capabilities for a very small number of commercial barges. This is facilitated in part by a 1972 agreement, commonly referred to as the "Forty-six Forty rule" describing an agreement between the Corps and Alabama Power Company (APC) to release a 7-day average of 4640 cfs from APC projects to maintain a 9-foot water elevation in the navigation channel of the Alabama River. However, downstream there are other significant commercial and ecological considerations: the frequency, timing and volume of freshwater released from upstream Corps dams have a profound impact on the ecology of the Mobile Bay and Mobile-Tensaw Delta, and are important factors for commercial and recreational fisheries in the Bay, including those for shrimp, blue crab and oyster (Braun 2004). The pattern of natural freshwater inflow into the Mobile Bay/Delta is characterized by being highly variable at multiple time scales. One of the flow parameters most affected by upstream water management is the loss of extreme low flow events. Braun (2004) estimated that flows lower than 2700 cfs would naturally occur below Claiborne Dam on average about every ten years, but now are likely to occur only every 60 years. Freshwater inflow significantly affects many important ecological processes including the shaping of bottom and bank habitat, inundation and exposure of habitat to air, salinity and water temperature gradients, circulation and distribution of nutrients and massive quantities of organic matter, and residence time of water within embayments (Braun 2004). Therefore, changes in the magnitude, timing and duration of flood and low-flow events, mediated in part by Corps dams, are a major factor in ecological maintenance and succession in the Bay and Delta. Maintaining a pattern of natural freshwater inflow into the Mobile Bay/Delta is therefore highly desirable from an economic as well as an ecological perspective.

3.1.3.2 Water quality

The Alabama River from the Mobile-Tensaw Delta to Claiborne L&D upstream has an ADEM stream use classification of fish and wildlife (ADEM 2000).

Dissolved oxygen

The water use classification for this reach has a 5.0 milligrams per liter (mg/L) DO standard except under extreme conditions due to natural causes, when it may range between 4.0 mg/L and 5.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

Recent water quality data indicate that DO concentrations have fallen below the state DO standard (5 mg/L) in the tailwaters of Claiborne L&D during the summer months, occasionally for days at time, but more commonly for several hours each day (USFWS Alabama Field Office file data, 2000-2002; ADEM preliminary data 2008-2009).

3.1.4 Habitat protection

Navigational dredging is a concern in this reach of the Alabama River. Dredging removes shoal habitats in river channels and changes natural patterns of erosion and deposition potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner, 1998). Land use practices along the mainstem of the Alabama River, as well as its tributaries, can degrade aquatic habitats critical to southern walleye and other fish species (USFWS 2006), and should be considered in Corps dam and reservoir operations.

In addition to dredging, impacts from nonpoint source pollution are significant. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under National Pollution Discharge Elimination System (NPDES) permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agricultural (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment) activities (AL Clean Water Partnership (CWP) 2005).

Priority sub-basins: Important tributaries that help maintain genetic flow and act as refugia in this reach include the Little River, Pine Log Creek, and Reedy/Little Reedy/Sandy Hill Creeks (Alabama Comprehensive Wildlife Conservation Strategy (CWCS) 2005). Flow parameters need to ensure connectivity with these streams.

Designated Critical Habitat: Critical habitat for the Alabama sturgeon was designated in 2009 in this reach (USFWS 2009). The only Alabama sturgeon captured in the past decade was caught in the tailwaters of Claiborne L&D in 2008, reinforcing the fact that the dam is a barrier to an extremely rare (but formerly abundant) species, and that the ecological integrity of the lower Alabama River is essential for keeping this species from becoming extinct.

3.1.5 Aquatic Organism Passage

Since 1969, the Claiborne L&D has impeded upstream passage of most, if not all, diadromous and migratory freshwater fish species under all but the highest spring flows (USACE 2000). Other than the occasional boat lockage or travel over the spillway, Claiborne L&D does not provide any means of upstream or downstream fish passage. Research conducted by the GSA indicates that a flow of 80,000 cfs is required to inundate the spillway structure (USFWS 2006). This occasionally occurs between February and April (USGS 2004). Contingent upon the timing of these flows, some stronger swimming fishes, like the blue sucker, appear to be capable of swimming upstream over the spillway. However, most fishes cannot swim upstream to historical spawning areas.

Use of the lock holds some promise for providing upstream fish passage. Recent Corps/Service studies indicate that slight modification in locking procedures can greatly increase the number of fish species passed. A 30-foot headwall in the lock might, however, limit the passage of some species. On-site consultation with Ben Rizzo, the Service's Senior Fishway Engineer, revealed that addition of a fish lift or vertical slot fishway would greatly enhance passage to a wider variety of species. Mr. Rizzo stated that these types of fishways can pass sturgeon. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan. Mettee et al. (2005) suggests that more than 35 fish species could benefit from passage improvements at Claiborne and Millers Ferry L&Ds. The fisheries program at Auburn University, in cooperation with the Corps, is beginning research on the efficacy of alternative locking procedures, including the use of pumps for attraction flows. We encourage the Corps to continue to facilitate this research.

Research by GSA also indicates that a variety of aquatic species freely pass downstream over the fixed-crest spillway of Claiborne L&D (Mettee et al. 2005), though the losses associated with this are unknown. Sturgeon species are not likely to utilize spillways for downstream travel, and are effectively trapped between dams under most current conditions.

3.1.6 River Reach Research Needs

- Implement and develop monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Service and AABC, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any species that has been identified as a primary host for a targeted mussel

(USFWS 2005a).

- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.2 Alabama River from Claiborne L&D to Millers Ferry L&D

3.2.1 River Reach General Description

This 60-mile reach of the Alabama River is contained entirely within the East Gulf Coastal Plain Province and encompasses Claiborne Reservoir, a 5,930-acre impoundment on its southern end (USACE 2001). Claiborne Reservoir is essentially a run-of-river impoundment that provides a 9-foot navigation channel up to Millers Ferry L&D. Unique habitats have developed in this reach as streamflow cuts down through the alluvial sediments to expose the limestone underlayment (Mettee et al. 1996). This results in streambeds with upland characteristics within the Coastal Plain (Mettee et al. 1996). The upper part of this reach experiences hydropower-influenced flows from the Millers Ferry hydropower facility.

3.2.2 Species

Fishes: Alabama shad, Alabama sturgeon, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, southern walleye, and ironcolor shiner are species of Federal/State interest that likely inhabit this reach of the Alabama River (Mettee et al. 1996; Boschung and Mayden 2004). Populations of many of these species have been significantly impacted by Claiborne L&D by being blocked or hindered from access to upstream spawning areas, particularly for those species that require long migrations to complete a part of their life cycle (e.g. Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, Gulf sturgeon, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Freshwater species of sportfishing interest that inhabit this reach include the striped bass, black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, southern acornshell, southern combshell, southern pigtoe, upland combshell, stirrupshell, rayed creekshell, heavy pigtoe, black sandshell, tulotoma snail, painted rocksnail, and cylindrical lioplax occurred in this reach. It is likely that the inflated heelsplitter, heavy pigtoe, and spotted rocksnail are still extant. Dive sampling in 2009 shows the tulotoma snail to still be extant (USFWS Alabama Field Office data). Valuable commercial mussel beds also occur within this reach (Hartfield and Garner 1998).

Plants: Georgia rockcress occurs on the steep upper banks of this reach of the Alabama River, and may rely on flooding to help reduce competition from other vegetation (USFWS Alabama

Field Office data). High flow events that scour river bluffs are likely beneficial to this plant. Botanists have long noted that the bluffs found along and above Claiborne L&D are botanically very species-rich, with fluvial geomorphic processes influencing short and long-term vegetation dynamics (Bill Finch, The Nature Conservancy, pers. comm. 2010)

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.2.3 Objectives

The Corps has an opportunity to protect reservoir fisheries and water quality, as well as restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats.

3.2.3.1 Instream flow

The flow regime in this reach is affected by peaking hydropower generation at Millers Ferry L&D as well as peaking hydropower generation and flood control operations at 14 other upstream dams in the Alabama, Coosa and Tallapoosa Rivers. Currently, there are no minimum flows required downstream of Miller's Ferry L&D, although there is an agreement with APC to provide enough water to maintain a navigation channel for a very small number of commercial barges.

3.2.3.2 Water quality

The Alabama River from Claiborne L&D upstream to the Frisco Railroad crossing has ADEM's stream use classifications of swimming, and fish and wildlife (ADEM 2000). From the Frisco Railroad crossing upstream to river mile 131 the reach is classified as fish and wildlife (ADEM 2000). From river mile 131 upstream to Millers Ferry L&D the river is classified as public water supply (ADEM 2000). A portion of the main channel in this reach is included on the state's 303(d) listed waters due to organic enrichment/low dissolved oxygen and nutrients as a result of dam construction, industrial discharges, flow regulation/modification, non-irrigated crop production, and pasture grazing (ADEM 2002). ADEM (2004) lists Claiborne Lake as eutrophic.

Dissolved oxygen

Alabama water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, DO may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should never be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from June-September 1983 revealed that the DO standard was met on all occasions in the Millers Ferry L&D tailrace, although August data closely approached the standard's limits (ADEM 1984). Comparisons of pre- and post-impoundment DO data indicate an 18% decline in average DO concentration (6.6 mg/L pre-impoundment to 5.4 mg/L post-impoundment) for August (ADEM 1984). Downstream effects of flow interruption and lower DO concentrations caused one major discharger to resort to a higher treatment, hold-and-release system for effluent discharge (ADEM 1984).

More recent water quality data indicate that DO concentrations fell below the state instantaneous DO standard (4 mg/L) in the tailwaters of Millers Ferry L&D during the summer months (FWS, Alabama Field Office file data, 2000-2002; ADEM preliminary data 2008-09).

3.2.4 Habitat protection

Navigational dredging is a concern in this reach of the Alabama River. Dredging removes shoal habitats and changes natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along the mainstem of the Alabama River, as well as its tributaries, can degrade aquatic habitats critical to southern walleye and other fish species.

In addition to dredging, nonpoint source pollution is a significant concern to be considered in Corps water management operations. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under NPDES permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta and river ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agriculture (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment and petroleum), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment and heavy metals) (AL CWP 2005).

Priority sub-basins: An important tributary that helps maintain genetic flow and acts as a refugia in this reach includes Limestone Creek (CWCS 2005). Flow parameters need to ensure connectivity with this stream.

Designated Critical Habitat: Critical habitat has been designated in this reach for the Alabama sturgeon, an extremely rare fish once found in abundance (USFWS 2009). The update to the WCM should consider research and monitoring to determine flow patterns that could help keep the species from becoming extinct.

Potential Reintroduction/Augmentation Site and Suitable Species: The Alabama River has been identified as a potential reintroduction/augmentation site for the inflated heelsplitter, orange-nacre mucket, heavy pigtoe, southern clubshell, and stirrupshell (Hartfield et al. 2010).

3.2.5 Aquatic organism passage

Other than the occasional boat lockage and traversing of the spillway, and some limited experiments with attraction flows and lock openings, Millers Ferry L&D does not currently allow any means of fish passage. However, modification of lock operation may hold some potential for providing upstream passage to migratory species. As shown at Claiborne L&D, Millers Ferry also has the potential to pass large numbers of riverine fishes, some of which are listed under the ESA. Under extremely limited sampled conditions, Mettee et al. (2005) collected 10 species in the Millers Ferry lock chamber in May 2004 by providing an attraction flow. Installation of an additional fishway device (e.g., a vertical slot fishway or fish lift) may also be required to help pass a wider variety of species, take advantage of attraction flows elsewhere below the lock and dam, and provide passage to another portion of the channel. Attraction flows stemming from hydropower generation could be problematic for fish passage since these occur downstream of the lock and dam and could draw migratory species away from the intended path of passage. Some type of mechanism to direct fish away from this area may also be warranted. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan. Mettee et al. (2005) suggests that more than 35 fish species could benefit from passage improvement at Claiborne and Millers Ferry L&Ds, not to mention opening-up access to the Cahaba River.

Downstream passage over the spillway at Millers Ferry L&D is possible for some migratory fish; however, turbine entrainment could have a severe negative impact on downstream migration. Screening of draft tube intakes and/or other devices that direct fish away from the turbines would be necessary to protect downstream migrants. A Corps plan to install debris diverters for the draft tubes has the potential of providing not only turbine protection, but also providing protection to downstream migrants. Modification of this device to protect migratory species should be seriously considered.

3.2.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- Explore and implement opportunities to augment/reintroduce mollusks and fishes into appropriate habitats.

- Evaluate the effects of channelization and reservoir flowage on adjacent side-channel, shallow water, oxbow lake-type habitats. These areas provide important nursery areas for many fish species, and are an important foraging resource for listed species such as the wood stork. Flood events and flow patterns prior to dam construction maintained the sediment dynamics necessary for relatively stable, shallow water side-channel floodplain features, but reservoir flows and channelization may have now changed floodplain sediment dynamics to the point where many of these shallow water side channels can only be maintained through repeated dredging of their inlets (Stan Cook, ADCNR, pers. comm. 2010).

- Develop Geographic Information System (GIS) databases that identify, characterize (e.g., bathymetry, current velocity, and substrate), and map stable riverine habitats.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.3 Alabama River from Millers Ferry L&D to R.F. Henry L&D

3.3.1 River Reach General Description

The section of the Alabama River between Millers Ferry and R.F. Henry L&D is 103 miles long and is contained entirely within the East Gulf Coastal Plain Province. The reach encompasses Dannelly Reservoir, a 17,200-acre impoundment formed by Millers Ferry L & D. Dannelly Reservoir is essentially a run-of-river impoundment that provides a 9-foot navigation channel up to R.F. Henry L & D. Although managed as a run-of-the-river impoundment, Millers Ferry L & D has a hydroelectric generating capacity of 75 MW (ADEM 1984), and hydropower peaking flows are experienced by aquatic species downstream of both Millers Ferry and R. F. Henry dams.

3.3.2 Species

<u>Fishes</u>: Alabama shad, Alabama sturgeon, American eel, Southeastern blue sucker, highfin carpsucker, paddlefish, quillback, skipjack herring, river redhorse, smallmouth buffalo, striped bass, and southern walleye are species of Federal/State interest that likely inhabit this reach of the Alabama River (Mettee et al. 1996; Boschung and Mayden 2004). Populations of many of these species have been significantly impacted downstream by Claiborne L&D by blocked or impaired access to upstream spawning areas, particularly for those species that require long migrations to complete a part of their life cycle (e.g. Gulf and Alabama sturgeon, American eel, and the Alabama shad). Frecklebelly madtom, Alabama sturgeon, bluenose shiner, ironcolor shiner, freckled darter and alligator gar are either absent or very rare in this reach. Freshwater species of sportfishing interest that inhabit this reach include the black basses, crappie, catfish, and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, painted rocksnail, fine-lined pocketbook, orange-nacre mucket, ovate clubshell, rayed creekshell, southern combshell, stirrupshell, black sandshell, and cylindrical lioplax occurred in this reach. It is likely that the inflated heelsplitter and spotted rocksnail still occur here, and recent dive sampling indicates that the heavy pigtoe, southern clubshell, and tulotoma snail are still extant in this reach (USFWS Alabama Field Office data; Pierson 1991; ADCNR unpublished data 2009). This reach contains several locations of concentrated densities of commercial mussel species (Hartfield and Garner 1998).

Plants: Georgia rockcress and Price's potato-bean occur on and near the banks of this reach of the Alabama River (USFWS Alabama Field Office data). Georgia rockcress likely benefits from flood-induced scour that reduces competition from other plants.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.3.3 Objectives

The Corps can help to protect reservoir fisheries and water quality as well as restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats.

3.3.3.1 Instream flow

The instream flow regime in this reach is affected by hydropower generation at R.F. Henry L&D as well as peaking hydropower generation/flood control operations at 13 other dams upstream in the Coosa and Tallapoosa Rivers. Currently, there are no required minimum flows downstream of R.F. Henry L&D, although there is an agreement with APC to release at least 4640 cfs from their upstream projects to provide a 9-foot navigation channel in the river.

3.3.3.2 Water quality

The Alabama River from Millers Ferry L&D upstream to Blackwell Bend has ADEM's stream use classification of swimming and fish and wildlife (ADEM 2000). From Blackwell Bend upstream to Henry L&D, the reach is classified as fish and wildlife (ADEM 2000). ADEM (2004) lists Dannelly Reservoir as eutrophic.

Dissolved oxygen

Water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from June-September 1983 revealed that the DO standard was met on all occasions in the Henry L&D tailrace. However, comparisons of pre- and post-impoundment DO data indicate a 35% decline in average DO concentration (7.1 mg/L pre-impoundment to 4.6 mg/L post-impoundment) for August (ADEM 1984). While greater waste load demands were experienced in recent years, ADEM (1984) conceded that water quality effects from impoundment and power generation were evident.

DO concentrations occasionally fall below the state DO standard (4 mg/L) in the tailwaters of Henry L&D (USFWS Alabama Field Office data, 2000-2002; ADEM preliminary data 2008-09).

Forebay profiles taken at the Millers Ferry L&D from June-September 1983 showed a moderate tendency toward DO stratification in June and July (ADEM 1984). Stratification was of such a moderate nature that DO concentrations stayed above 4.0 mg/L all the way to the bottom of the forebay (about 55 feet); the rest of the sampling period concentrations were similar throughout the water column (ADEM 1984). As at other projects where forebay and tailrace DO concentrations were above the standard, the shorter reservoir retention period probably accounts for the more favorable water quality (ADEM 1984).

3.3.4 Habitat protection

Dredging has removed shoal habitats and changed natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along tributary streams can also degrade aquatic habitats critical to southern walleye and other fish species (USFWS 2006).

In addition to dredging, impacts from nonpoint source pollution are significant and need to be taken into account during dam and reservoir operations. Pollutant and nutrient concentrations are important ecological considerations during periods of low flow, when aquatic species may already be stressed from lower DO and reduced habitat availability. Pollutant concentrations required under NPDES permits are often cited by industry on the Alabama River as a reason to maintain unnaturally high flow during periods of natural drought, despite the importance of low flows in shaping Delta and river ecology. Research is needed to determine which species are most impacted under low-flow/high pollutant concentration conditions, and the flow patterns that are most beneficial under varying pollutant loads. Within the reach, this includes pollution from agricultural (nutrients, sediment, bacteria, and pesticides), aquaculture (nutrients and bacteria), forestry (sediment, nutrients, and thermal changes), roads (sediment), urban/residential development (sediment, nutrients, bacteria, and pesticides), and mining (sediment) activities (ALCWP 2005).

Priority sub-basins: Important tributaries that help maintain genetic flow and act as refugia in this reach include Bogue Chitto Creek, Big Swamp Creek, Cahaba River, Chilatchee Creek, Dry Cedar Creek, Little Mulberry Creek, and Mulberry Creek (ACWCS 2005; Bogan and Pierson 1993b). Flow parameters need to ensure connectivity with these streams.

Designated Critical Habitat: The Alabama River from the confluence of the Cahaba River (Alabama RM 198.1) upstream to the confluence with Big Swamp Creek (RM 183.5) is designated critical habitat for the southern clubshell and orange-nacre mucket. Bogue Chitto Creek from its confluence with the Alabama River (RM 169.8) upstream to U.S. Highway 80 is also designated critical habitat for the southern clubshell, Alabama moccasinshell, and orange-nacre mucket (USFWS 2004). Critical habitat for the Alabama sturgeon has been designated in the Alabama River to below R.F. Henry L&D, and in the Cahaba River to Centreville (USFWS 2009). The WCM update should focus on developing and implementing a flow regime that protects and enhances habitat for these species.

<u>Potential Reintroduction/Augmentation Site and Suitable Species</u>: The Alabama River has been identified as a potential reintroduction/augmentation site for the inflated heelsplitter, orange-nacre mucket, heavy pigtoe, southern clubshell, and stirrupshell (Hartfield et al. 2010).

3.3.5 Aquatic organism passage

Millers Ferry L&D is an impediment to upstream fish passage by migratory species, such as Alabama sturgeon, Gulf sturgeon, Alabama shad, paddlefish, smallmouth buffalo, southern walleye, and blue sucker. Downstream passage over the Henry L&D spillway is possible for some fish species; however, turbine entrainment could have a severe negative impact on downstream migration. Screening of draft tube intakes and/or other devices that direct fish away from the turbines is necessary to protect downstream migrants.

Modification of lock operations holds potential for providing upstream passage to migratory species. As has been shown at Claiborne L&D, relatively minor modifications in locking procedures can greatly increase upstream passage for some species. However, installation of a fishway device (e.g., a vertical slot fishway or fish lift) would help pass a greater abundance and wider variety of species through this facility. Downstream attraction flows stemming from hydropower generation could be problematic for fish passage, so some type of mechanism to divert migratory fish away from this area may also be warranted. Providing fish passage at this facility would address Recovery Objective 2.4 of the Gulf Sturgeon Recovery/Management Plan and Objective 8.5.9.1 of the Gulf Striped Bass Fishery Management Plan.

3.3.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Alabama Aquatic Biodiversity Center, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any other species that has been identified as a primary host species for a targeted mussel (USFWS 2005b).

- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.

- Examine the effects of channelization and reservoir flowage on silting in of the inlets of adjacent side-channel, shallow water habitats. These areas provide important nursery areas for many fish species, and are an important foraging resource for listed species such as the wood stork. Flood events and flow patterns prior to dam construction maintained the sediment dynamics necessary for a relatively stable side-channel floodplain feature, but reservoir flows and channelization may have now changed floodplain sediment dynamics to the point where many of these shallow water side channels can only be maintained through repeated dredging of their inlets (Stan Cook, ADCNR pers. comm. 2010).

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.4 Alabama River from R.F. Henry L&D to Jordan/Bouldin Dams (Coosa River)

3.4.1 River Reach General Description

This reach contains the transition between the portion of the ACT Basin managed by the Corps and the section controlled primarily by dams operated by Alabama Power Company (APC) on the Coosa and Tallapoosa Rivers. The lower dam on this reach, R.F. Henry Dam, is operated by the Corps, while Jordan and Bouldin Dams are operated by APC. Ecological issues described below for this reach will need to be addressed by both the Corps and APC.

This 80-mile reach of the Alabama River is contained entirely within the East Gulf Coastal Plain Province and includes Woodruff Reservoir, a 12,510-acre impoundment formed by R.F. Henry L&D. Woodruff Reservoir is essentially a run-of-the-river impoundment that provides a 9-foot navigation channel up to Montgomery. Although managed as a run-of-river impoundment, R. F. Henry L & D does have a hydroelectric generating capacity of 68 MW (ADEM 1984). Aquatic species downstream of R.F. Henry are affected by hydropeaking flows not only from the R.F. Henry turbines, but also from the dams upstream on the Coosa and Tallapoosa Rivers. Another feature of this reach is the 5-mile long tailrace canal from Bouldin Dam that bypasses the main channel and enters the Coosa River 12 miles downstream of Jordan Dam. The tailrace downstream of Jordan Dam receives a continuous minimum flow ranging from 2,000 cfs during the summer-fall-winter months, to 4,000 cfs during the spring months. Due to this minimum flow, the Jordan tailrace has developed into a spotted bass fishery, and also offers one of the best restoration opportunities for mollusks and fishes in the entire Mobile River Basin. This unique area is located over a geologic formation known as the Fall Line, which is the transition zone between high gradient upland streams and low gradient coastal plain streams. The stretch of the Coosa upstream of the Fall Line was historically characterized by a series of shoals collectively called the Coosa Falls; however, the rivermen of the late 1800s often used more colorful terms for these areas like, the Narrows, Devil’s Race, Butting Ram Shoals, Hell’s Gap, and the Devil’s Staircase -- most of which are now inundated by Jordan, Mitchell, and Lay reservoirs (Jackson

1995). These names were due in part to the rapid change in elevation the Coosa experienced over its last sixty miles before crossing the Fall Line and joining the Tallapoosa River near the town of Wetumpka. The last exposed remnant of this geologic formation is the stretch between Jordan Dam and Wetumpka known as Moccasin Shoals.

3.4.2 Species

Fish: Historically, the Alabama shad, Alabama sturgeon, American eel, and Gulf sturgeon occurred in this reach (Mettee et al. 1996; Boschung and Mayden 2004); however, populations of these species have been severely impacted by Claiborne, Millers Ferry, and R.F. Henry Dams which block or hinder fish access to upstream spawning areas. The southeastern blue sucker, highfin carpsucker, paddlefish, quillback, river redhorse, southern walleye, smallmouth buffalo, and striped bass are species of federal/state interest that continue to inhabit the mainstem and/or tributaries of this reach (Mettee et al. 1996; Boschung and Mayden 2004). Other freshwater species of state interest include black basses (e.g., the Jordan tailrace is recognized as a world class spotted bass fishery), crappie, catfish, freshwater drum and sunfishes (USFWS 2006).

Mollusks: Historically, the Alabama moccasinshell, fine-lined pocketbook, triangular kidneyshell, Coosa moccasinshell, southern pigtoe, orange-nacre mucket, ovate clubshell, southern purple lilliput, southern clubshell, southern combshell, stirrupshell, delicate spike, Alabama spike, black sandshell, Coosa creekshell, cylindrical lioplax, interrupted rocksnail, lacy elimia, painted rocksnail, teardrop elimia, cobble pebblesnail, flat pebblesnail, and spotted rocksnail occurred in this reach, many of which have been extirpated or are presumed extinct (Johnson 2002). Recent collections indicate that the fine-lined pocketbook may exist in this reach, along with the largest population of the tulotoma snail, which occurs in a reach approximately 3.5 miles downstream of Jordan Dam (Bogan and Pierson 1993a; Johnson 2002). A 1995 study reported a stable and healthy population of over 109 million tulotoma snails inhabiting this reach (Christman et al. 1995). Christman et al. (1995) also documented an increase in shoreline habitat use by the snail that was attributed to increased habitat availability resulting from the implementation of continuous minimum flow releases at Jordan Dam. The interrupted rocksnail (previously extirpated in Alabama) was reintroduced into the reach in 2003 after not being collected for nearly 50 years. This reach also supports one of the two known populations of the rough hornsnail (Mirarchi et al. 2004).

Plants: Georgia rockcress and Price's potato-bean occur on and near the banks of this reach of the Alabama River (USFWS Alabama Field Office data). Georgia rockcress likely benefits from flood-induced scour that reduces competition from other plants.

Birds: Bald eagles and wood storks forage in this reach (USFWS Alabama Field Office data). Floodplain inundation, controlled in part by upstream dams, is important in maintaining fish populations in shallow water habitats utilized by these birds.

3.4.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, and reduce the effects of hydropower-induced flow pulses from upstream dams. The Corps can also help restore federally protected, resident and migratory aquatic species to historic abundances in remaining habitats. The area downstream of Jordan Dam to Wetumpka has been identified as an important reach for the augmentation/reintroduction of several target species (Hartfield et al. 2010; Johnson 2002).

3.4.3.1 Instream flow

The instream flow regime in this reach is affected by impoundment at R.F. Henry L&D, hydropower generation at Jordan and Bouldin Dams, as well as by peaking hydropower/flood control operations at 11 other upstream dams in the Coosa and Tallapoosa River basins in Alabama and Georgia. From 1928, the first year of operation for Jordan Dam, until 1992, no allowances were made for minimum flows in its tailwaters. Flow was exclusively determined by hydroelectric demand, reservoir spillage, and prevailing weather patterns. In fact, beginning in 1967 with the completion of the Bouldin Dam, discharge through this dam's 5.5-mile tailrace cut-off bypassed approximately 12 miles of river below Jordan Dam for extended periods. This situation basically continued until 1992 when APC, as a condition of Federal Energy Regulatory Commission (FERC) relicensing, was required to provide a minimum instream flow to the bypassed mainstem of 2,000 cfs in the summer-fall-winter months and 4,000 cfs during the spring months (APC/KA 2000a). Further operational modifications were subsequently made to allow for short periods of increased flow (up to 10,000 cfs) to enhance kayaking, whitewater rafting, and fishing (APC/KA 2000a). At present, adjustments to the minimum flow are made using a ramping schedule that decrease flow at the rate of about 67 cfs or 133 cfs/day (APC/KA 2000a) to avoid stranding aquatic species. Minimum releases were chosen as a management approach to reduce the adverse effects of intermittent and/or peaking discharges from Jordan and Bouldin Dams. These minimum flows have had a significant positive effect on water quality and the aquatic community downstream of Jordan Dam.

3.4.3.2 Water quality

The Alabama River from Henry L&D upstream to Pintlala Creek and Catoma Creek has ADEM's stream use classification of fish and wildlife and partially supports its designated use (ADEM 2004). Causes for impairment are listed as organic enrichment, and DO. The entire Bouldin Tailrace Canal and the Coosa River from its mouth to Jordan Dam his classified for fish and wildlife (ADEM 2000).

Dissolved oxygen

Water use classifications for this reach have a 5.0 mg/L DO standard, except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

ADEM sampling from May-September 1983 revealed that the DO standard was not met on two occasions in the Jordan Dam tailrace during July and August (ADEM, 1984). On these occasions DO levels were extremely low (1.1 mg/L and 1.6 mg/L, respectively). However since a continuous minimum flow was implemented in 1994 and continuous monitoring began in 1995, this standard is rarely violated (APC 2005). Recent water quality data collected by APC between 1995 and 2003 (APC 2005) indicates that the Jordan Dam tailrace is typically in compliance with the required state standard for DO (Figure 2).

Forebay profiles taken at the R.F. Henry Lock and Dam from June-September 1983 showed that a very slight DO stratification occurs in July and August, but subsides by September (ADEM 1984). Stratification was so slight in nature that DO concentrations stayed above 3.5 mg/L to the bottom of the forebay (about 55 feet); the rest of the sampling period concentrations were similar throughout the water column (ADEM 1984). As at other projects where forebay and tailrace DO concentrations were above the standard, the shorter reservoir retention period probably accounts for the more favorable water quality (ADEM 1984).

Erosion and sedimentation

Water releases through the Bouldin Dam into the Bouldin Tailrace Canal are causing excessive erosion and measures should be taken to implement a comprehensive bank stabilization strategy in this area (ADCNR 2000).

3.4.4 Habitat protection

Dredging has removed shoal habitats and changed natural patterns of erosion and deposition, potentially accelerating bank erosion and causing the destruction of aquatic habitats (Hartfield 1993; Hartfield and Garner 1998). Land use practices along tributary streams can degrade aquatic habitats critical to southern walleye and other fish species.

Priority sub-basins: Catoma Creek and Pintlala Creek are important tributaries for genetic flow and refugia in this reach (ACWCS 2005). Flow parameters should maintain connectivity with these streams.

Designated Critical Habitat: The Coosa River from Alabama State Highway 111 upstream to Jordan Dam is designated critical habitat for the southern clubshell, ovate clubshell, southern acornshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, Coosa moccasinshell, southern pigtoe, and fine-lined pocketbook (USFWS 2004). Critical habitat for the interrupted rocksnail and rough hornsnail has also been proposed for this area.

Potential Reintroduction/Augmentation Site and Suitable Species: The mainstem of the Coosa River from Wetumpka upstream to Jordan Dam have been identified as a potential reintroduction/augmentation site for the Alabama moccasinshell, fine-lined pocketbook, ovate clubshell, southern acornshell, southern clubshell, southern pigtoe, triangular kidneyshell, upland combshell, Coosa moccasinshell, Alabama spike, delicate spike, tulotoma snail, cylindrical lioplax, flat pebblesnail, painted rocksnail, interrupted rocksnail, and lacy elimia (Hartfield et al. 2010).

3.4.5 Aquatic organism passage

Modification of lock operations holds potential for providing upstream passage to migratory species. As has been shown at Claiborne Lock and Dam, relatively minor modifications in locking procedures can greatly increase upstream passage for some species. However, installation of a fishway device (e.g., a vertical slot fishway or fish lift) would help pass a greater abundance and wider variety of species through this facility.

3.4.6 River Reach Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Using an adaptive management approach, evaluate alternative locking procedures to determine the most efficient means of passing the largest number of aquatic species.

- In cooperation with the Alabama Aquatic Biodiversity Center, explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include the Alabama sturgeon and any other species that has been identified as a primary host species for a targeted mussel (USFWS 2005b).

- Determine if fish host restoration is needed to sustain mussel restoration efforts (Johnson 2002). Fish surveys conducted in the Jordan tailrace by APC in 1997 indicated that the site apparently lacks large populations of many common darters and minnows that are known mussel hosts.

- Develop a Geographic Information System (GIS) database that identifies, characterizes (e.g., bathymetry, current velocity, and substrate), and maps stable riverine habitats.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.5 Coosa River from Weiss Dam to Mouth of Etowah River

3.5.1 River Reach General Description

The Coosa River, from its origin at the confluence of the Oostanaula and Etowah Rivers in Georgia, flows in a westerly direction 60 miles to Weiss Dam, which is operated by APC (GAEPD 1998). Resource management issues in this reach are shared by the Corps and APC. This reach of the Coosa River is contained within the Valley and Ridge and Cumberland Plateau

Provinces and includes Weiss Reservoir, a 30,200-acre impoundment on its southern end (APC/KA 2000b). Weiss Reservoir has 447 miles of shoreline and a maximum depth of 62 feet (APC 1995b). Weiss Dam is operated for peaking hydroelectric production with a generating capacity of 88 MW (ADEM 1984). Additionally, this reach contains the remnants of the Mayo's Bar Lock and Dam, a former Corps project constructed in the early 1900's about 8 miles downstream of Rome, Georgia.

3.5.2 Species

Fish: Alabama shad, American eel, Gulf sturgeon, Alabama sturgeon, lake sturgeon, freckled madtom, trispot darter, and the saddleback darter are thought to have occurred in the Coosa River and/or its tributaries, but have apparently been extirpated. The Southeastern blue sucker and river redhorse occur elsewhere in the Coosa River drainage but have been apparently extirpated from this reach (Freeman et al. 2005; Burkhead et al. 1997). The blue shiner, flame chub, lined chub, Coosa chub, burrhead shiner, river redhorse, stippled studfish, holiday darter, coldwater darter, goldstripe darter, rock darter, freckled darter, river darter, southern walleye, smallmouth buffalo and striped bass (self-sustained population) are species of Federal/State interest that continue to occur within the Coosa River and/or its tributaries (Mettee et al. 1996; Boschung and Mayden 2004; Pierson 1998; Burkhead et al. 1997; Freeman et al. 2006). The lake sturgeon is a species that has been recently reintroduced in the Coosa River in Georgia. Other freshwater species of sportfishing interest that inhabit riverine and lacustrine habitats in this reach include black basses, crappie, catfish, freshwater drum and sunfishes (USFWS 2006).

Mollusks: Historically, approximately 36 freshwater mussel species were known from the Coosa River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Coosa River and its tributaries included the Alabama spike, delicate spike, Alabama moccasinshell, cylindrical lioplax, fine-lined pocketbook, flat pebblesnail, heavy pigtoe, inflated heelsplitter, orange-nacre mucket, , southern acornshell, southern clubshell, southern pigtoe, Georgia pigtoe, triangular kidneyshell, southern purple lilliput, Alabama creekmussel, Coosa creekshell, and upland combshell (Burkhead et al. 1997; Williams and Hughes 1997; USFWS 2000). Recent records indicate that the Coosa moccasinshell is a species of Federal/State interest that continues to occur in tributaries of this reach (USFWS 2000). The southern clubshell and fine-lined pocketbook are still found in the Weiss Bypass channel, the old river channel prior to dam construction. Surveys of the mainstem Coosa River conducted in the late 1990's located live specimens of the flat floater, washboard, paper pondshell, and threehorn wartyback. Shell material of other species was identified for Coosa fiveridge, elephantear, fragile papershell, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, butterfly, and the southern clubshell (Williams and Hughes 1997).

Plants: Harperella and Kral's water plantain are riverine plants that occur within the active channel of major tributaries of this reach. If surveys report these in the Coosa mainstem,flow dynamics could have a major influence on their ability to persist (USFWS 2000).

3.5.3 Objectives

The Corps has an opportunity to help protect reservoir fisheries, as well as restore resident and migratory aquatic species to historic abundances in remaining suitable riverine habitats.

3.5.3.1 Instream flow

Completion of Weiss Dam in 1961 resulted in bypassing flows around a 22-mile section of the mainstem Coosa River (hereafter referred to as "bypass channel"). The bypass channel is an important restoration location for mussels and other aquatic organisms formerly found in abundance in the Coosa River (Herod et al. 2001). Management of upper ACT Basin Corps projects in a manner that meets upstream ecosystem objectives and provides sufficient flows in the Weiss Bypass channel is of critical importance. The bypass channel is also adversely affected by the operation of Weiss Dam which, during peak generation, reverses flow in at least the lower 14 miles of the bypass channel. A continuous minimum flow should be determined and implemented to restore the riverine character of the bypass channel which could be facilitated by installing and using an appropriately-sized turbine or by releasing water through the project's spillway or trash gates (ADCNR 2000). We have recommended that APC, as part of the hydropower license on Weiss Dam, in general provide 10% of Coosa River flow coming into Weiss reservoir for the Weiss Bypass channel. However, this recommendation is only adequate if the Corps releases an adequate amount of water from Allatoona and Carters dams to meet downstream ecological needs.

3.5.3.2 Water quality

The Coosa River from the Weiss Dam powerhouse upstream to Spring Creek has ADEM's stream use classification of public water supply, swimming, and fish and wildlife classifications (ADEM 2000). From Spring Creek to the state line, swimming and fish and wildlife are the applicable classifications (ADEM 2000). The Coosa mainstem between Weiss Dam and the Georgia-Alabama state line is included on the state's 303(d) listed waters as partially supporting state water use classifications due to priority organics, nutrient enrichment and pH from flow regulation/modification and upstream sources (ADEM 2002).

The Coosa River at the Alabama-Georgia state line is classified by the Georgia Environmental Protection Division (GAEPD) for recreation and fishing (GAEPD 2001). From the state line upstream to the confluence of the Etowah and Oostanuala Rivers the classification is fishing (GAEPD 2001). Portions of the Coosa mainstem and Big Cedar Creek are on the Georgia 303(d) listed waters as not supporting its water use classification. This is a result of violations of water quality standards for metals and fecal coliform bacteria (GAEPD 1998).

<u>Dissolved oxygen</u>

Water use classifications for the Alabama portion of this reach require a 5.0 mg/L DO standard at all times; except under extreme conditions due to natural causes, it may range between 5.0 mg/L and 4.0 mg/L, provided that the water quality is favorable in all other parameters (ADEM 2000). DO levels should not be less than 4.0 mg/L due to hydroelectric turbine discharges from existing hydroelectric generation impoundments (ADEM 2000).

Forebay profiles taken during August and September 1983 showed that Weiss Reservoir experienced temperature stratification, but only slight stratification with respect to DO concentration (ADEM 1984). As a consequence of this slight stratification in 1983, ADEM reported DO concentrations above 2.0 mg/L to a depth of 40 feet (ADEM 1984). The shallow depth of the reservoir and the frequency of generation observed suggests minimal retention times and thus a mixed instead of a stratified reservoir (ADEM 1984). Forebay sampling conducted by APC during June to October of 1990-1999 indicated that Weiss Reservoir may become more stratified than suggested by previous sampling (APC/KA 2000b). APC/KA (2000b) reported a stratification tendency at depths of 15 to 20 feet during mid summer that at times extended for 60 to 90 days. During a number of these stratification periods, DO concentrations were <2.0 mg/L at a depth of 15 feet (APC/KA 2000b).

3.5.4 Habitat protection

Along Weiss Reservoir, considerable natural shoreline habitat has been converted to vertical bulkheads which eliminate shallow shoreline habitat so important to juveniles of many game fish species (ADCNR 2000). The permitting process for shore stabilization should be modified to require other less destructive types of shoreline structures.

Priority sub-basins: Little River is an important tributary for genetic flow and refugia for this reach (ACWCS 2005).

Designated Critical Habitat: There are no areas designated as critical habitat on the existing mainstem of the Coosa in this reach or in any sub-basins, although it should be noted that a portion of the Weiss Bypass Channel is designated critical habitat for the southern acornshell, ovate clubshell, southern clubshell, upland combshell, triangular kidneyshell, Coosa moccasinshell, southern pigtoe and fine-lined pocketbook (USFWS 2004). Maintenance of natural flows through the Weiss Bypass channel will benefit these species

3.5.5 Aquatic organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Local interest in raising the level of the Mayo Bar Lock and Dam (MBL&D) by two feet could however negatively impact striped bass upstream spawning movements from Weiss Reservoir and survival of their eggs and larvae in the Oostanaula River (USFWS 2006). However, if data become available that indicate Weiss Dam adversely affects resident/migratory species because of blockage of movements or entrainment, then fish passage/screening strategies should be developed and implemented.

3.5.6 River Reach Research Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.6 Etowah River from Coosa River to Allatoona Reservoir

3.6.1 River Reach General Description

This approximately 48 mile stretch of the Etowah River flows generally westward from Allatoona Reservoir toward its confluence in western Georgia with the Oostanaula River, where together they form the Coosa River. The Etowah River below Allatoona Dam is contained within the Ridge and Valley Physiographic Province. Allatoona Reservoir is a 19,200-acre impoundment built for flood control, navigation, hydroelectric power and recreation, with a hydroelectric generating capacity of 80 MW (USACE 1998).

3.6.2 Species

Fish: American eel, lake sturgeon, blue shiner, lined chub, emerald shiner, southeastern blue sucker, river redhorse, freckled madtom, chain pickerel, coldwater darter, trispot darter, coal darter, and river darter are thought to have occurred in the Etowah River and/or its tributaries, but have apparently been extirpated The lake sturgeon is a species that has been recently reintroduced in the upper Coosa River Basin in Georgia. The Coosa chub, burrhead shiner, Etowah darter, Cherokee darter, rock darter, , amber darter, and freckled darter are species of Federal/State interest thought to still occur in the Etowah River and its tributaries (Freeman et al. 2006; Freeman 1998; USACE 2000; Burkhead et al. 1997). Surveys have been initiated in 2010 to evaluate persistence and spatial distribution of fishes in the mainstem Etowah River below Allatoona Dam.

Mollusks: Historically, approximately 40-50 freshwater mussel species were known from the Etowah River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Etowah River and its tributaries included the rayed creekshell, Alabama spike, delicate spike, Alabama moccasinshell, cylindrical lioplax, fine-lined pocketbook, flat pebblesnail, southern acornshell, southern clubshell, southern pigtoe, Georgia pigtoe, triangular kidneyshell, Alabama creekmussel, Coosa creekshell, and upland combshell (USFWS 2000, USACE 2000, Burkhead et al. 1997, Williams and Hughes 1997). Surveys have been initiated in 2010 to determine which species are still extant in the Etowah River below Allatoona Dam. Surveys of the mainstem Etowah River below Allatoona Dam conducted in the late 1990's located live specimens of the fragile papershell and pistolgrip. Shell material of the elephantear was also identified (Williams and Hughes 1997).

3.6.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, instream flow, and reduce the effects of hydropower-induced flow pulses from upstream dams. The Corps also has an opportunity and responsibility to protect reservoir fisheries, as well as restore resident and some migratory aquatic species to historic abundances in remaining suitable riverine habitats.

State and federal agency representatives, private landowners, business owners, and conservation groups held a public stakeholder meeting at Red Top Mountain State Park, Georgia on August 8, 2009. The intent of this meeting was to openly discuss and develop a vision for upper ACT Basin water management, with the explicit intent to inform our collective efforts to update the WCM. Radio announcements, newspaper announcements, and fliers were distributed to advertise the meeting and harness public interest and participation. The Corps was invited to attend this meeting but no Corps representative was sent. Stakeholders at the meeting 1) agreed that water management in the upper ACT could be improved to benefit the multiple water uses and 2) developed a list of fundamental and means objectives for water management below upper ACT Corps projects (Figure 3). The Corps needs to engage this diverse group of stakeholders because this effort is broad in scope, encompasses multiple stakeholders, acknowledges multiple demands on water resources, and is intended to improve the WCM and flow management. It was generally agreed that an adaptive management approach to flow management would be beneficial.

3.6.3.1 Instream flow

The instream flow regime in this reach is affected by hydropower/flood control operations at Allatoona Dam. The hydropower facility generates power between 2 and 6 hours during normal operations each weekday. Power is generated on weekends as necessary, but generally only the minimum flow of 250 cfs (320 cfs with leakage) is released. Flow instability from hydropower fluctuations between 320 cfs and 7,500 cfs likely affects recruitment and reproduction of many fish species (*sensu* Freeman 2001), including those acting as host species for freshwater mussels (Layzer and Crigger 2001; Watters 2000). Providing longer periods of stable flow during critical spawning and rearing seasons should increase opportunities for recruitment and reproduction of freshwater organisms (*sensu* Freeman 2001). The minimum flow requirement at Allatoona Dam (250 cfs) was developed based on the 7Q10 flow calculation. Use of the 7Q10 was intended to facilitate estimation of the allowable pollutant concentrations, but was later adopted as a minimum flow requirement below dams. Thus, the 7Q10 minimum flow requirement does not address ramping rates, frequency, duration, timing, or magnitude of flows that are important flow components that affect the persistence of aquatic organisms. A more comprehensive flow management strategy is warranted. As we have shown in our PAL for the ACF, seasonal flow variation (e.g., magnitude, timing, duration, and frequency of low and high flows) need to be integrated into project operations so that the authorized project purpose of Fish and Wildlife is met.

3.6.3.2 Water quality

The Etowah River from the Oostanaula confluence to the Allatoona Dam is classified by the GAEPD for recreation and fishing (GAEPD 2001). Water temperature is an important ecological cue for reproduction, migration and other life history aspects of aquatic organisms. However, water temperatures below Allatoona Reservoir are lower than would naturally occur due to hypolimnetic release from Allatoona Dam. Temperatures do not return to expected natural values until more than 25 miles downstream of the dam, which may explain why the Etowah darter does not occur in this reach (Duncan et al. 2010). Daily temperature fluctuations occur naturally, but are also affected by hydropeaking. Although the cooler temperatures found in the Etowah River support a recreational fishery for striped bass (Matt Thomas, GA DNR, pers. comm. 2010), temperature fluctuations that are induced by dam operations are likely to negatively affect both striped bass and non-game species.

Temperature and dissolved oxygen

Dissolved oxygen diffusers were installed and used in Lake Allatoona from 1968 to 1986. Since cessation of DO diffuser use, multiple studies showed that dissolved oxygen frequently falls below 2.0 mg/L (USACE 2000) below Allatoona Dam. DO measurements made by Georgia EPD in 2001 show that summer and fall months have the lowest DO concentrations and that DO concentrations are higher downstream near Cartersville, Georgia (Figure 4; EPA STORET data accessed in 2009). 100% of all DO measurements in August and September of 2009 below Allatoona Dam were below 4.0 mg/L, and were sometimes < 1.0 mg/L (Figure 5; USFWS unpublished data collected in 2009). These data unequivocally show that operation of Allatoona Dam violates Georgia state water quality standards and that dam operation does not meet the authorized purposes of Fish and Wildlife Management and Water Quality.

3.6.4 Habitat protection

This reach of river could benefit significantly from a flow regime that would allow shallow water habitats to persist long enough for important life stages of target species to develop.

Designated Critical Habitat: There are no areas designated as critical habitat on the Etowah River.

3.6.5 Aquatic Organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Loss of connectivity between headwaters and lower reaches remains a serious concern for the ecological integrity of the system.

3.6.6 River Reach Research Needs

- Develop and implement and/or participate in monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Implement and/or assist in surveys to determine distribution and abundance of rare and federally protected aquatic species in the watershed.

- Determine and implement non-peaking flow windows during portions of the year critical to aquatic organisms.

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

3.7 Oostanaula-Coosawattee Rivers below Carters Reservoir

3.7.1 River Reach General Description

Below Carters and Carters Reregulation Dams, the Coosawattee meets with the Conasauga and forms the Oostanaula River, which in turn becomes the Coosa at its confluence with the Etowah in Rome, Georgia. The Coosawattee River system flows westward. The river and tributaries drain the Southern Blue Ridge, Southern Ridge and Valley, and Piedmont physiographic provinces. Carters Dam on the Coosawattee River creates Carters Reservoir, a 3220-acre impoundment built for flood control, navigation, hydroelectric power and recreation (USACE 1998). Flows from Carters Dam are partly reregulated by Carters Rereg Dam, located immediately downstream.

3.7.2 Species

<u>Fish:</u> American eel, lake sturgeon, blue shiner, lined chub, bluehead chub, river chub, quillback, highfin carpsucker, southeastern blue sucker, freckled madtom, chain pickerel, coldwater darter, amber darter, coal darter, Coosa bridled darter, freckled darter, and river darter are thought to have occurred in the Oostanaula and Coosawattee Rivers and/or their tributaries, but have apparently been extirpated in at least portions of these river basins (Freeman et al. 2005; Freeman 1998; Burkhead et al. 1997). The lake sturgeon is a species that has been recently reintroduced into the upper Coosa River Basin in Georgia. The lined chub, Coosa chub, burrhead shiner, river redhorse, rock darter, trispot darter, goldline darter, freckled darter, river darter, southern walleye, smallmouth buffalo and striped bass are of Federal/State interest that occur within this reach and/or its tributaries (Mettee et al. 1996; Boschung and Mayden 2004; Pierson 1998; Freeman et al. 2005).

Mollusks: Historically, approximately 43 freshwater mussel species were known from the Oostanaula River and its tributaries and approximately 20 freshwater mussel species were known from the Coosawattee River and its tributaries (Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Oostanaula River and its tributaries included the rayed creekshell, Alabama spike, delicate spike, southern acornshell, southern clubshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, southern pigtoe, Georgia pigtoe, fine-lined pocketbook, cylindrical lioplax, flat pebblesnail, inflated heelsplitter, and Coosa creekshell (USFWS 2000; Williams and Hughes 1997). Some of the mollusk species historically inhabiting the Coosawattee River and its tributaries included the Alabama spike, southern clubshell, Georgia pigtoe, and triangular kidneyshell (Williams and Hughes 1997). Surveys of the mainstem Oostanaula River conducted in the late 1990's located live specimens of the Coosa fiveridge, elephantear, southern pocketbook, fragile papershell, washboard, threehorn wartyback, triangular kidneyshell, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, and paper pondshell. Shell material of the Alabama spike, southern combshell, Alabama heelsplitter, and southern clubshell was also identified (Williams and Hughes 1997). Surveys of the mainstem Coosawattee River below Carters Dam and a short reach above Carters Reservoir conducted in the late 1990's located live specimens of Alabama spike, fragile papershell, Pleurobema sp., purple heelsplitter, triangular kidneyshell, giant floater, Alabama orb, Coosa orb, ridged mapleleaf, pistolgrip, and paper pondshell. Shell material of other species was located for the elephantear and southern pocketbook (Williams and Hughes 1997). The Service also located live individuals and shell material of the threehorn wartyback in the mainstem Coosawattee below Carters Dam in 2007 (Alice Lawrence, USFWS, pers. comm. 2010).

3.7.3 Objectives

The Corps has an opportunity in this reach to protect and enhance water quality, instream flow, and reduce the effects of ramping from upstream dams. The Corps can also help to protect reservoir fisheries, as well as restore resident and migratory aquatic species to historic abundances in remaining suitable riverine habitats.

State and federal agency representatives, private landowners, business owners, and conservation groups held a public stakeholder meeting at Red Top Mountain State Park, Georgia on August 8, 2009. The intent of this meeting was to openly discuss and develop a vision for upper ACT Basin water management, with the explicit intent to inform our collective efforts to update the WCM. Radio announcements, newspaper announcements, and fliers were distributed to advertise the meeting and harness public interest and participation. The Corps was invited to attend this meeting but no Corps representative was sent. Stakeholders at the meeting 1) agreed that water management in the upper ACT could be improved to benefit the multiple water uses and 2) developed a list of fundamental and means objectives for water management below upper ACT Corps projects (Figure 3). The Corps needs to engage this diverse group of stakeholders because this effort is broad in scope, encompasses multiple stakeholders, acknowledges multiple demands on water resources, and is intended to improve the WCM and flow management. It was generally agreed that an adaptive management approach to flow management would be beneficial, but to facilitate the Corps modeling efforts, we recommend the approach for flow modeling used in the ACF PAL utilizing the methods of Mathews and Richter (2007).

3.7.3.1 Instream flow

The Carters Lake project is a hydroelectric pump-storage peaking facility, with hydropower generation occurring several hours each weekday. When electrical demand is low, water is pumped back into Carters Lake, which avoids the downstream problems associated with a hydropeaking flow regime. The minimum flow requirement at Carters Reregulation Dam (240 cfs) was developed based on the 7Q10 flow calculation. Use of the 7Q10 was intended to facilitate estimation of the allowable pollutant concentrations, but was later adopted as a minimum flow requirement below dams. Thus, the 7Q10 minimum flow requirement does not address ramping rates, frequency, duration, timing, or magnitude of flows that are important flow components that affect the persistence of aquatic organisms. A more comprehensive flow management strategy is warranted given the biodiversity and number of imperiled species below Carters Dam and Carters Rereg Dam. Seasonal flow variation (e.g., magnitude, timing, duration, and frequency of low and high flows) needs to be integrated into project operations so that the authorized project purpose of Fish and Wildlife is met.

3.7.3.2 Water quality

The Oostanaula River carries the GAEPD's water use classification of recreation and fishing (GAEPD 2001)

Temperature and dissolved oxygen

Tailrace temperatures and dissolved oxygen levels have not been collected and analyzed regularly below Carters Rereg Dam. Although data collected in August and September 2009 below Carters Rereg Dam show that DO levels meet state water quality standards (Figure 6), we recommend continuous monitoring as part of standard operating procedures for the project, particularly during the summer and fall.

3.7.4 Habitat protection

Despite the completion of the Carters Lake project in 1975, to date no mitigation for loss of significant aquatic resources has been developed. Mitigation for wildlife (including wetland and terrestrial ecosystems) has been debated but not resolved. Approximately 4,200 terrestrial acres were inundated, 40.9 miles of streams were impounded, 0.4 miles of stream were filled, and wetland loss is unknown. Terrestrial and stream impacts should be included in the DEIS and mitigation measures should be implemented.

Priority sub-basins: The Conasauga River and Holly Creek are important tributaries for genetic flow and refugia. Flow management needs to ensure adequate connectivity with these streams.

Designated Critical Habitat: Critical habitat has been designated for the southern acornshell, ovate clubshell, southern clubshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, Coosa moccasinshell, southern pigtoe, and fine-lined pocketbook in the following river reaches: (USFWS 2004)

1. Oostanaula River mainstem from confluence with the Etowah River upstream to the confluence of the Conasauga and Coosawattee Rivers.
2. Coosawattee River from its confluence with the Conasauga River upstream to GA Hwy. 136.
3. Conasauga River mainstem from its confluence with the Coosawattee River upstream to Murray County Rd 2.
4. Holly Creek mainstem from its confluence with the Conasauga River upstream to the confluence of Rock Creek.

3.7.5 Aquatic organism passage

Species that once migrated through this area have for the most part been extirpated or have had access to the reach blocked by the continuous chain of reservoirs further downstream in the Coosa River. Loss of connectivity between headwaters and lower reaches remains a serious concern for the ecological integrity of the system.

3.7.6 River Reach Information Needs

- Develop and implement monitoring programs to determine the effects of upstream dams on federally protected species, migratory and resident fishes, and macroinvertebrate (e.g., mussel and snail) populations.

- Determine patterns of natural flow variability to utilize as a template for water management decisions using the methods of Mathews and Richter (2007).

- Implement surveys to determine distribution and abundance of rare, and federally protected aquatic species in the watershed.

- Implement water quality monitoring to identify problems associated with dam operations, and adjust operations as necessary.

- Explore opportunities to augment/reintroduce mollusks and fishes into appropriate habitats. Target fishes include those that have been identified as a primary host species for a targeted mussel.

4.0 SUMMARY

The Corps, in the DEIS for the WCM update, at minimum should address the following issues:

1. **Low DO below reservoirs, and meeting of State water quality standards**: we recommend that DO and temperature be monitored above and below Corps dams throughout the water column during summer low-flow periods to identify problem areas and develop courses of action. We will evaluate using:
    a. Total number of days with dissolved oxygen below a daily average of 5.0 mg/L;
    b. Total number of instantaneous “measurements” less than 4.0 mg/L;

c. Monthly exceedance figures and box plots with outliers for dissolved oxygen (mg/L);
d. Monthly exceedance figures and box plots with outliers for water temperature; and
e. Average stream percent wastewater.

2. **Protection and enhancement of remaining free-flowing river habitats**: we recommend identification and mapping using a GIS, with characterization of substrates, analysis of patterns of sediment deposition and scour, and development of species inventories. We will evaluate using the percent of free-flowing stream channel identified as high quality habitat and available for aquatic species reintroductions by the AABC, as well as the percent of free-flowing stream channels impacted by dredging, sedimentation, and poor water quality conditions that do not meet State standards.

3. **Aquatic organism passage at dams, particularly in the upstream direction**: we recommend continuing to facilitate research on timing, duration and efficacy of using alternative locking procedures and attraction flows to re-establish ecological connectivity of the river system. We also recommend continued research on fish passage facilities and structures, and methods to screen aquatic organisms from effects of turbines. We will evaluate success by the number of priority species and individuals shown to successfully pass through Corps L&Ds.

4. **Temperature effects on species of concern from reservoirs and hydroelectric operations**: as with DO, we recommend monitoring to determine problem areas, and development of possible alternative storage and release protocols to minimize ecological degradation. We will evaluate using the percent of free-flowing stream channel impacted by reservoir-induced changes in water temperature.

5. **Minimum flows available for Weiss bypass channel**: with APC, develop minimal flows and patterns of natural flows released from upstream Corps dams to ensure viability of federally listed mollusk populations in the Weiss Bypass channel. We will evaluate by determining frequency, timing, and duration of inadequate water levels to support mussels and other aquatic species, and the frequency, timing and duration of backflow events from peaking flows from the Weiss Reservoir.

6. **Conservation and recovery of natural flow variability, and reduction of effects of hydropower peaking flows on species of concern**: we recommend that as many environmental flow components as possible be developed and implemented below Corps dams using the methods of Mathews and Richter (2007). We recommend research that identifies critical flow periods where peaking flows should be avoided to ensure viability of important spawning and rearing life stages. We will evaluate by comparing unaltered flow pattern estimates with USGS gage data and proposed flows in the DEIS. The potential change in frequency of low-flow events below Claiborne Dam is also of interest.

7. **Maintenance of floodplain connectivity to flood pulses**: we recommend developing patterns of natural flow that approximate pre-dam inundation frequency, timing and duration in free-flowing sections of the ACT Basin. We will evaluate by comparing estimated pre-dam flow parameters with USGS gage data to estimate changes in return intervals of bankfull and higher flood events, and changes in seasonal timing and duration of flood events. Similar to the ACF PAL, we are also interested in the frequency (% of days) of growing season (April-October) floodplain connectivity (acres) to the main channel; and frequency (% of years) of growing season (April-October) floodplain connectivity (acres) to the main channel.

8. **Potential for reintroductions, enhancements of listed species populations in the basin**: we recommend that the Corps develop a cooperative relationship with the AABC to develop adaptive management protocols and coordinate reintroductions and enhancement of habitat for federally listed species. We will evaluate using the percent of river reaches that are classified by the AABC as high quality habitat suitable for aquatic reintroductions by the AABC, and that meet State water quality guidelines.

9. **Restoration and maintenance of healthy water quality parameters for all life stages of aquatic species under a variety of flow conditions**: we recommend that the Corps develop monitoring programs that identify existing and potential water quality problems related to Corps dam and hydropower operations, and use their water management authority to limit and mitigate water quality issues that develop in Corps reservoirs and tailwaters. We will evaluate using the percent of the ACT mainstem river length that meets State water quality criteria during low-flow periods.

10. **Development of adaptive management protocols that include goals, objectives, research and monitoring to allow greater understanding of riverine ecosystem response to complex variables**: we recommend the Corp consider an approach explicitly designed to develop new information that can inform ongoing dam and reservoir operations. We will evaluate by comparing pre-and post WCM update operational guidelines and practices.

There are numerous other issues of importance including potential effects of climate change, and potential future water use scenarios in the ACT Basin. However, the above issues clearly need to be addressed in order to halt ongoing environmental damage to fish and wildlife resources.

To conclude, the Service feels strongly that the Corps should begin building an adaptive management framework for operations that explicitly outlines goals and objectives of operations, continually monitors and analyzes ecosystem response, and adjusts operations accordingly based on what we have learned. We strongly recommend research and monitoring be primary components of dam operations.

Because of Corps dam operations, many river segments do not meet State water quality standards. Corps dams do not provide adequate habitat for fish and wildlife. So that Corps projects meet their authorized purposes of water quality and fish and wildlife, we strongly recommend that the Corps work with the Service to comprehensively evaluate and modify the WCM.

The updating of the WCM should not commit the Corps to additional long-term continual degradation of this river system, recognized worldwide for its incredible biotic wealth. Instead, the Corps now has an opportunity and an obligation to use their authority and resources to protect and enhance the ecological integrity of the ACT Basin. If you have any questions about this PAL, in Alabama please contact Dan Everson at (251) 441-5837 or in Georgia, contact Will Duncan or Alice Lawrence at (706) 613-9493.

Sincerely,

William J. Pearson
Field Supervisor
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LITERATURE CITED

ADCNR (Alabama Department of Conservation and Natural Resources). 2000. Letter to Mr. Barry K. Lovett and Mr. Mike Akridge, Alabama Power Company, July 18, 2000 and December 5, 2000.

ACWCS (Alabama's Comprehensive Wildlife Conservation Strategy). 2005. Alabama's Draft Comprehensive Wildlife Conservation Strategy. Accessed October 6, 2005 , 229 p.

ADEM (Alabama Department of Environmental Management). 1984. Effect of hydroelectric dams on water quality in Alabama. Montgomery, AL.

----- 2000. Rules and Regulations, Water Quality Program, Division 6 Volume 1. Montgomery, AL.

----- 2002. Alabama's final 2002 section 303(d) list. Accessed at http://www.adem.state.al.us/WaterDivision/WQuality/303d/WQ303d.htm, October 24, 2005.

----- 2004. Alabama's 2004 integrated water quality monitoring and assessment report.

AL CWP (Alabama River Clean Water Partnership). 2005. Draft Alabama River Basin Management Plan. February 4, 2005.

APC (Alabama Power Company). 2005. Application to the Alabama Department of Environmental Management for water quality certification for the Weiss, Neely Henry, Logan Martin, Lay, Mitchell, Jordan and Bouldin hydroelectric developments. 9,933 pp.

----- 1995b. Project 2146; Weiss Dam-Public Safety Plan.

APC/KA (Alabama Power Company/Kleinschmidt Associates). 2000a. Coosa and Warrior River relicensing: Jordan Project and Bouldin Development, Initial Information Package. 415 p.

----- 2000b. Coosa and Warrior River relicensing: Weiss Development, Initial Information Package. 281 p.

Atkins, J.B., H. Zappia, J.L. Robinson, A.K. McPherson, Moreland, R.S. Harned D.A., B.F. Johnston, and J.S. Harvill. 2004. Water quality in the Mobile River Basin, Alabama, Georgia, Mississippi, and Tennessee, 1999-2001: U.S. Geological Survey, Circular 1231, 40 p.

Bogan, A.E., J.M. Pierson, and P. Hartfield. 1995. Decline in the freshwater gastropod fauna in the Mobile Bay Basin. Pages 249-252 *in* E.T. LaRoe, G.S. Farris, C.E. Puckett, P.D. Doran, M.J. Mac, editors. Our Living Resources, A report to the Nation on the distribution, abundance and health of U.S. plants, animals and ecosystems. U.S. Department of the Interior, National Biological Survey, Washington, DC.

Bogan, A.E., and J.M. Pierson. 1993a. Survey of the aquatic gastropods of the Coosa River Basin, Alabama: 1992. Final report to the Alabama Natural Heritage Program, Unpubl, 72 pp.

------- 1993b. Survey of the aquatic gastropods of the Cahaba River Basin, Alabama: 1992. Final report to the Alabama Natural Heritage Program, Unpubl, 76 pp.

Boschung H.T., and R.L. Mayden. 2004. *The Fishes of Alabama*. Smithsonian Books, Washington, D.C. 736 pp.

Braun, D.P. 2004. Freshwater biohydrology of the Mobile Bay/Delta conservation area: a needs assessment. Unpublished report prepared for the Alabama Chapter of the Nature Conservancy. 49 pp.

Brooks, A. 1994. River channel change. Pages 55-75 *in* P. Calow and G.E. Petts, editors. The Rivers Handbook, Hydrological and Ecological Principals. Vol 2. Blackwell Scientific Publications, Boston.

Burkhead, N.M., S.J. Walsh, B.J. Freeman, and J.D. Williams. 1997. Status and restoration of the Etowah River, an Imperiled Southern Appalachian Ecosystem. Pages 375-444 in G.W. Benz and D.E. Collins, editors, Aquatic Fauna in Peril, The Southeastern Perspective. Special Publication 1, Southeast Aquatic Research Institute. Lenz Design and Communications, Decatur, GA.

Christman, S.P., F.G. Thompson, and E.L. Raiser. 1995. *Tulotoma magnifica* (Conrad) (Gastropoda: Vivpariade) status and biology in the Coosa River below Jordan Dam, Alabama. Department of Natural Sciences, Florida Museum of Natural History, Gainesville, FL.

Duncan, W. W., A. Lawrence, E. Prowell. 2010. Effects of Allatoona Dam on Etowah River Temperatures in June 2009: Modeled Effects and Actual Measurements. Unpublished U.S. Fish and Wildlife Service Report, Athens, GA. 12 pp.

Dunne, T., and Leopold, L.B., 1978. Water in Environmental Planning. W.H. Freeman Co. San Francisco, CA.

Freeman, B.J., B.A. Porter, S. Ritchea, C. Straight, and B. Dakin. 2006. Genetic population structure of the federally endangered Etowah darter, Etheostoma etowahae, and subsequent range modification. A report submitted to the Georgia Department of Natural Resources. 22pp.

Freeman, B.J. 1998. Survey of threatened and endangered fishes in the Oostanaula, Coosawattee and Etowah Rivers. University of Georgia. 33pp.

Freeman, M .C., Z.H. Bowen, K.D. Bovee and E.R. Irwin. 2001. Flow and effects on juvenile fish abundance in natural and altered flow regimes. Ecological Applications 11:179-190. 2001.

GAEPD (Georgia Environmental Protection Division). 1998. Coosa River Basin Management Plan. Atlanta, GA.

----- 2001. Rules and Regulations for Water Quality Control, Chapter 391-3-6. Atlanta, GA. 114 p.

Hartfield, P., P. Johnson, S. Ahlstedt, M. Buntin, R. Butler, J. Garner, M. Gangloff, J. Powell, and S. McGregor. 2010. A Plan for the Population Restoration and Conservation of Freshwater Mollusks of the Mobile River Basin. Report by the Mobile River Basin Mollusk Restoration Committee. 103 pp.

-------- 1993. Headcuts and their effects on freshwater mussels. Pages 131-141 *in* K.S. Cummings, A.C. Buchanan, and L.M. Koch, editors. Proceedings of a UMRCC symposium. Conservation and Management of Freshwater Mussels.

Hartfield, P. and J. Garner. 1998. Report on dive surveys of the lower Alabama River. Unpublished report., 17p.

Herod, Jeffrey J., H. N. Blalock-Herod, D.S. Ruessler, and J.D. Williams. 2001. Examination of the freshwater mussel (Bivalvia:Unionidae) community, including the federally endangered southern clubshell, Pleurobema decisum, within the Old Channel of the Coosa River, between Weiss Spillway Dam and Weiss Hydropower Dam, Cherokee County, Alabama. Unpubl report to the Alabama Power Company, 54 p.

Jackson, H.H. 1995. *Rivers of History: Life on the Coosa, Tallapoosa, Cahaba, and Alabama*. University of Alabama Press, Tuscaloosa and London. 300 pp.

Johnson, P.D. 2002. Survey and site evaluation regarding the mollusk restoration potential of the Coosa River from Jordan Dam to Wetumpka, Elmore County, Alabama; and the artificial augmentation of the fine-lined pocketbook, *Lampsilis altilis*, in the old Coosa River channel at Centre, Alabama. Unpublished Report.

Junk, W.J., P.B. Bayley, and R.E. Sparks. 1989. The flood-pulse concept in river-floodplain systems, p. 110-127. *In* D.P. Dodge [ed.] Proceedings of the International Large River Symposium. Can. Spec. Publ. Fish. Aquat. Sci. 106.

Layzer, J.B. and D. Crigger. 2001. The relationship between stream discharge and mussel recruitment. Final Report for Research Work Order 30. United States Geological Survey , Biological Resources Division. June 2001.

Mathews, R., and B.D. Richter. 2007. Application of the indicators of hydrologic alteration software in environmental flow setting. Journal of the American Water Resources Association 43: 1400-1413.

Mettee, M. F., P. E. O'Neil, T. E. Shepard, and S. W. McGregor. 2005. A study of fish movements and fish passage at Claiborne and Millers Ferry Locks and Dams on the Alabama River, Alabama. Open-File Report 0507. 29 pp.

Mettee, M.F., and T.E. Shepard. 2001. Status Survey of the Southeastern Blue Sucker (*Cycleptus meridionalis*) in the Alabama River, 1995-2000. Report to the ADCNR, Tuscaloosa, AL 36 pp.

Mettee, M.F., P.E. O'Neil, and J.M. Pierson. 1996. *Fishes of Alabama and the Mobile Basin*. Oxmoor House, Birmingham, AL. 820 pp.

Mirarchi. R.E., ed. 2004. *Alabama Wildlife, volume 1, A checklist of vertebrates and selected invertebrates aquatic mollusks, fishes, amphibians, reptiles, birds, and mammals*. The University of Alabama Press, Tuscaloosa.

Mirarchi. R.E., J.T. Garner, T.M. Haggerty, M.F. Mettee, and P.E. O'Neil, eds. 2004. *Alabama Wildlife, volume 2, imperiled aquatic mollusks and fishes*. The University of Alabama Press, Tuscaloosa.

Poff, N.L., J.D. Allan, M.B. Bain, J.R. Karr, K.L. Prestegaard, B.D. Richter, R.E. Sparks, and J.C. Stromberg, 1997. The Natural Flow Regime. BioScience 47:769-784.

Postel, S. and B. Richter. 2003. Rivers for Life: Managing Water for People and Nature. Island Press. 253 pp.

Richter, B.D., J.V. Baumgartner, D.P. Braun, and J. Powell. 1998. A spatial assessment of hydrologic alteration within a river network. Regulated Rivers 14:329-340.

Sparks, R.E., J.C. Nelson, Y. Yin. 1998. Naturalization of the flood regime in regulated rivers. BioScience 48(9):706-720.

USACE (U.S Army Corps of Engineers). 1990. Interim Report: Tombigbee River Basin joint study, Alabama and Mississippi, Mobile, Alabama. pp. 158, 160-162.

-----1998. Draft EIS, Water Allocation for the Alabama-Coosa-Tallapoosa (ACT) River Basin. Mobile District .

USFWS (U.S. Fish and Wildlife Service). 2000. Mobile River basin aquatic ecosystem recovery plan. Atlanta, GA. 128 pp.

----- 2004. Endangered and threatened wildlife and plants; designation of critical habitat for three threatened mussels and eight endangered mussels in the Mobile River Basin; final rule. *Federal Register,* Vol. 69, No. 126: 40084-40171.

------ 2005a. Technical/agency draft recovery plan for six Mobile River Basin aquatic snails. U.S. Fish and Wildlife Service, Jackson, MS.

------ 2005b. Technical/Agency Draft Recovery Plan for the Alabama sturgeon (*Scaphirynchus suttkusi*). U.S. Fish and Wildlife Service, Daphne, AL.

------2006. Aquatic Resource Management Plan for the Alabama River Basin. U.S. Fish and Wildlife Service, Daphne, AL. 124 pp.

------2009. Designation of Critical Habitat for Alabama sturgeon (Scaphirrynchus suttkusi). Federal Register, Vol. 74, No. 104:26487-26510.

USFWS/EPA (Environmental Protection Agency). 1999. Instream Flow Guidelines for the ACT and ACF Basins Interstate Water Allocation Formula. Atlanta, GA. 14 pp.

Watters, G.T. 2000. Freshwater mussels and water quality: A review of the effects of hydrologic and instream habitat alterations. Proceedings of the First Freshwater Mollusk Conservation Society Symposium, 1999, Ohio Biological Survey.

Williams, J.D. and M.H. Hughes. 1997. Freshwater mussels (Unionidae) of selected reaches of the main channel of rivers in the Coosa drainage in Georgia. 21pp.

Figure 1. USGS gage data at Claiborne L&D during a low flow period showing daily pattern of high and low flows related to hydropower discharges from Millers Ferry and other dams upstream.

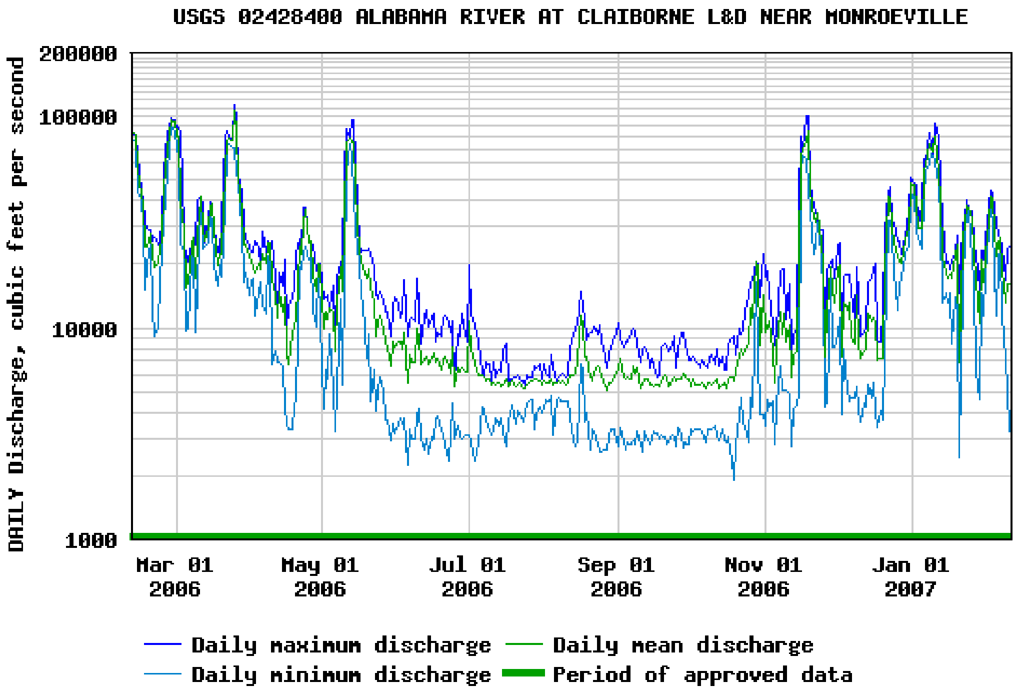


Figure 2. Continuous dissolved oxygen (DO) data collected in the Jordan Dam Tailrace, 1995-2000. Data extracted from APC's 401 Water Quality Application to ADEM, December 2005 (APC, 2005).

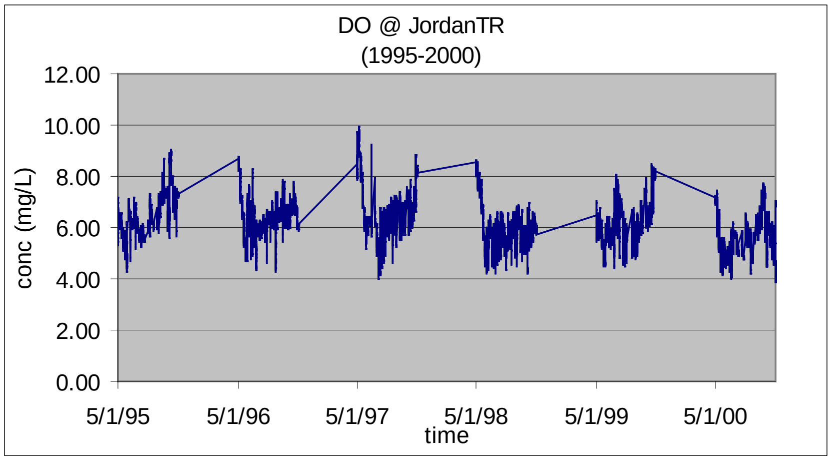


Figure 3. Fundamental (F) and Means (M) objectives developed by consensus at the stakeholders meeting on August 8, 2009 at Red Top Mountain State Park, Georgia.

F. Maximize potential for imperiled species
F. Maximize native aquatic biodiversity
F. Preservation of cool-water sport fishery (stripers, sturgeon)
M. No significant increase in summer water temperatures (late June – early Oct) above current conditions
F. Adequate flows for assimilation of waste and for municipal and industrial purposes
F. Optimizing economic value of the lakes
M. Maintaining lake levels for home owners (Allatoona only) and recreation (boat ramps), water supply
F. Maintaining reservoir and downstream water quality
M. Maintain appropriate supply and transport of bed sediment for instream habitat purposes
M. Mimic natural rates of bank erosion
M. Maintaining lake levels for reservoir and downstream water quality
M. Maintain adequate flows (e.g. magnitude, variability, timing, non-peaking window) for aquatic fauna downstream
M. Dissolved oxygen and temperature levels suitable for aquatic biota
F. Flood control
F. Hydropower generation
M. Meeting projected energy needs
F. Navigation in the lower Mobile Basin
F. Downstream recreational activities (paddling, fishing)
F. Preservation of cultural resources
F. Preservation of agricultural uses
F. Minimize impacts on fundamental objectives downstream

Figure 4. Dissolved oxygen concentrations in the Etowah River at one location upstream from Allatoona Reservoir (SR 53 near Dawsonville), and three locations below Allatoona Dam. Data obtained from EPA's STORET database. Primary data source is GA EPD.

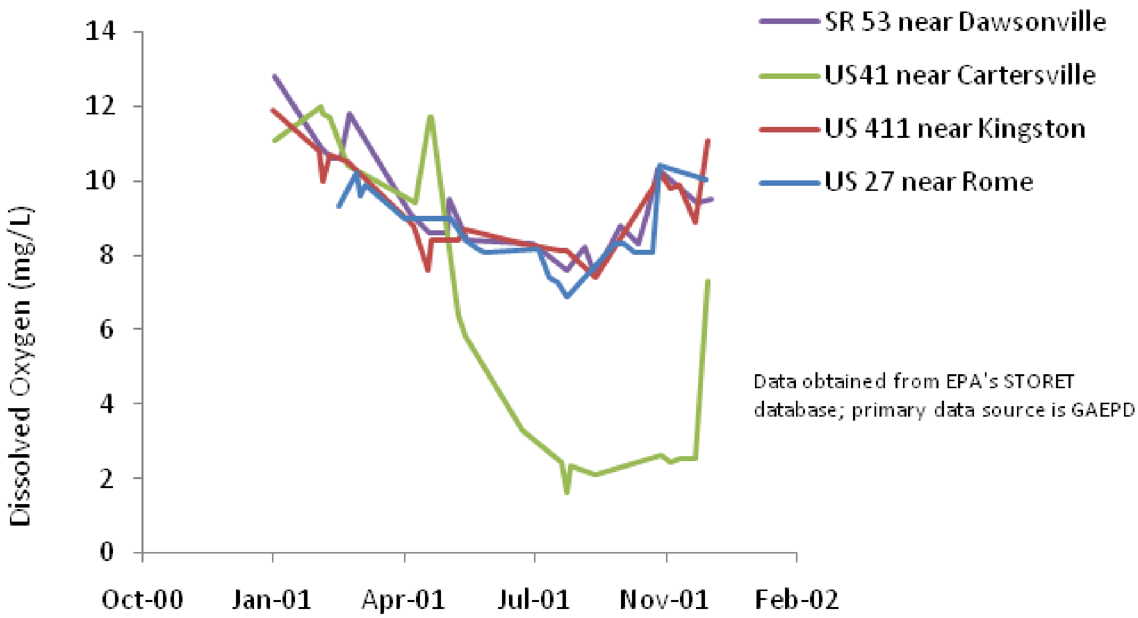


Figure 5. Temperature and dissolved oxygen data collected by the USFWS in the Etowah River approximately 400 meters below Allatoona Dam in August and September 2009.

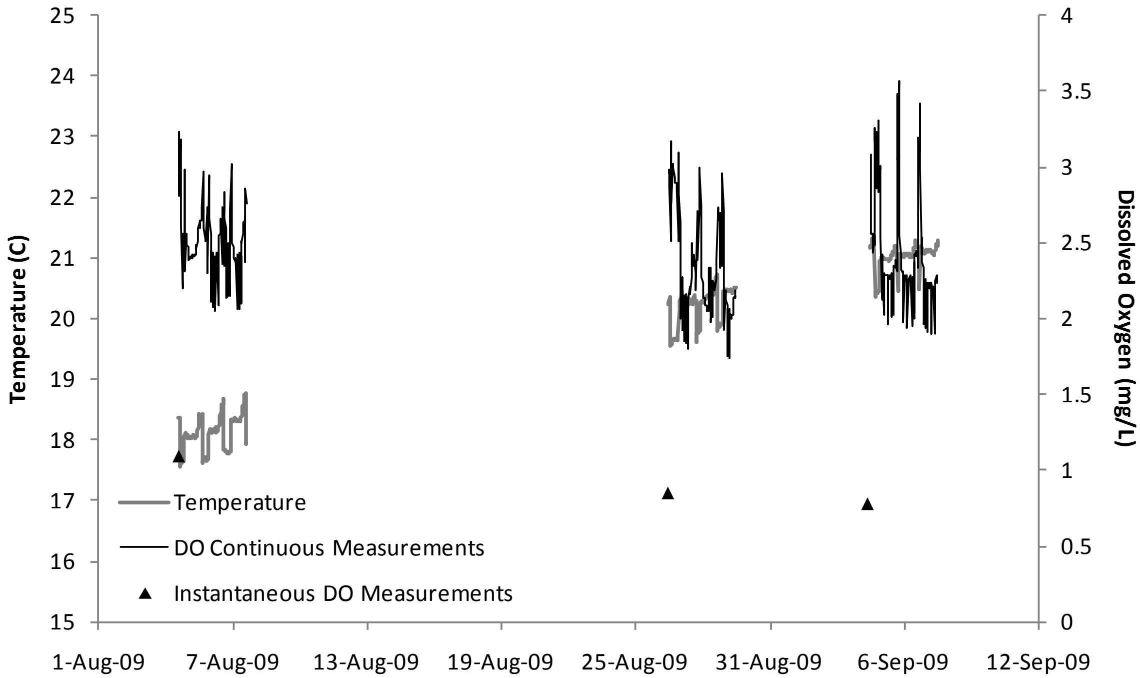
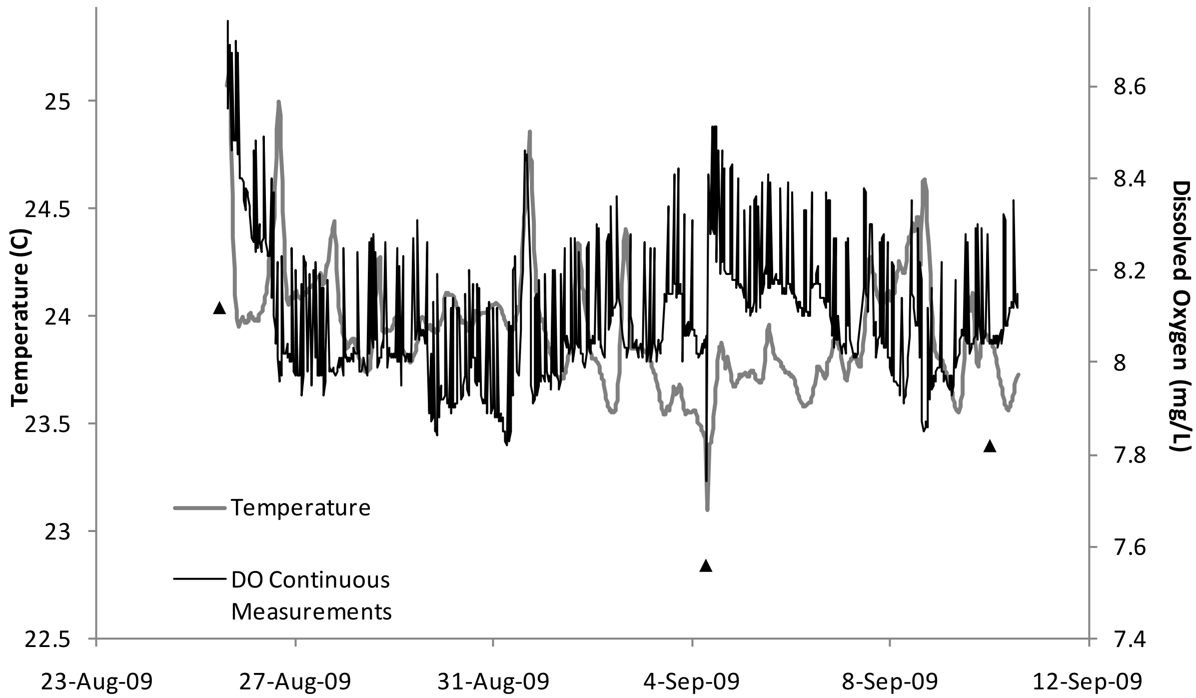


Figure 6. Temperature and dissolved oxygen data collected by the USFWS in the Coosawattee River approximately 400 meters downstream from Carter's Rereg Dam in August and September 2009.



Appendix IV: Service's August 13, 2010, Supplement to PAL to the Corps.

August 13, 2010

To: Brian Zettle, US Army Corps of Engineers, Mobile District
From: Dan Everson, US Fish and Wildlife Service, Alabama Ecological Services Field Office

RE: Supplement to Planning Aid Letter, ACT WCM update.

This responds to the U.S. Army Corps of Engineers' (Corps) request for further details regarding how the US Fish and Wildlife Service (Service) will evaluate alternatives in the Corps' draft Environmental Impact Statement (DEIS) for the proposed updating of the Water Control Manuals for Corps-operated dams in the Alabama-Coosa-Tallapoosa (ACT) Basin. It is intended to supplement the Planning Aid letter provided by the Service dated May 3, 2010.

1. ResSim Model Output Analyses

It is our understanding that ResSim will be used for the Corps' flow analyses. The flow statistics used by the Service in the past to analyze the resulting datasets were derived by using the Indicators of Hydrologic Alteration (IHA) and the Range of Variability Approach (RVA). Because flow is a master variable in fluvial systems, and because the ecology of fish and wildlife is closely linked to the flow regimes in which they evolved, the current evaluation should continue to rely on tools such as IHA, RVA, and Environmental Flow Components (EFCs) (Mathews and Richter 2007). Specific flow statistics and species-specific flow-ecology relationships (as available) that are important to natural resource sustainability should also be considered.

2. HEC-5Q Water Quality Model Output Analyses

It is our understanding that HEC-5Q will be used for the Corps' water quality analyses. We understand that this model predicts water quality parameters in six hour time intervals in river and reservoirs. Similar to the analyses contained in the Corps' 1998 draft EIS (Corps 1998), the analyzed data should be composed of summer values (May through October), separated by drought, dry, average, and wet year types for each alternative. The following information should be developed for each alternative to evaluate the effects on water quality and aquatic resources in the modeled tailrace and riverine locations:

- Total number of days with dissolved oxygen below a daily average of 5 mg/L, including separate measurements for benthic and surface sampling locations;
- Total number of instantaneous "measurements" less than 4 mg/L in benthic and surface sampling locations;
- Monthly exceedance figures and box plots with outliers for dissolved oxygen (mg/L);
- Monthly exceedance figures and box plots with outliers for water temperature; and
- Average stream percent wastewater.

For each alternative, the following information should be developed to evaluate the effects on water quality and aquatic resources for the modeled ACT reservoir locations:

- Average values of summer Chlorophyll a (*u*g/L);
- Average summer retention time (days); and
- Average summer phosphorus loading (pounds/acre/month).

3. Floodplain Connectivity Analyses

Assessing the extent of floodplain inundation will be a critical component of the alternatives analysis assessment. The magnitude, duration, timing, frequency, and rate of change of ACT floodplain inundation should be evaluated using the relationships quantified by Light et al. 1998 and Light et al. 2006.

The 2-year recurrence interval discharge to approximate the incipient point of flooding should be used to evaluate the frequency, duration, and timing of floodplain inundation. Because channel alteration (e.g., channel incision) can increase the recurrence interval at which flooding occurs and because we have little information on channel alteration, other data sources should be investigated to aid in the floodplain inundation assessment.

4. Reservoir Fisheries Analyses

Sport fisheries are important recreational and economic resources in all of the Federal ACT reservoirs. Based on interviews of fisheries managers and researchers in the basin, Ryder et al. (1995) identified the species considered critical in an evaluation of operating alternatives and the relative acceptability of reservoir levels for these species. A Delphi technique was used to obtain expert opinion for select reservoirs on reservoir fish guilds, important seasonal periods for those species, and acceptability ratings for various reservoir levels in the ACF and ACT (Ryder et al.

1995). The Service cooperated with the Corps for the 1998 draft EIS for ACT water allocation to develop a reservoir fisheries performance measure using the findings of Ryder et al. (1996). This information was used to create a reservoir fisheries performance measure by looking at the critical spawning and rearing periods, reservoir elevations during these times, and assigning a greater weight to stable or rising elevations during those time periods. The performance measures were then compared for the various alternatives.

The reservoir fisheries performance measure should be updated with additional information, literature, and/or relevant datasets that have been developed in the past ten years, and used to evaluate the relative impacts of the Corps' alternatives on reservoir sport fisheries.

5. Riverine Fisheries Analyses

Sport fisheries are also important recreational and economic resources in the riverine portions of the ACT project. Reproduction of many fishes is intricately tied to the floodplain, and alteration of flow regimes can affect reproductive success, year-class strength, growth, condition, and other life-history attributes. Data identified to date will be provided by the FFWCC and the USGS and used to evaluate the relative impacts of the Corps' alternatives on riverine sport fisheries. Specific measures to be evaluated include year-class strength versus acres of inundated floodplain spawning habitat, changes in catch rates of sportfishes in various water years, and changes in relative weight (condition) of sportfishes in various water years.

6. Federally-Protected Species Analyses

It is our understanding that the Corps will be conducting certain analyses to evaluate the effects of the various alternatives on federally-protected species. These analyses will be contained in the Corps' Biological Assessment (BA) accompanying the draft EIS. The Service will include these analyses in our FWCA evaluation, assuming they are available for us to do so.

Alabama Sturgeon

It is important that Alabama sturgeon be able to migrate upstream to spawning areas in the spring, and the eggs be allowed to develop as river currents carry them back downstream. It has been estimated that eggs must be carried downstream approximately 130 miles to develop properly, indicating that some flow past dams is necessary for the species to survive in the ACT basin. Therefore, the following parameters will be used to evaluate Corps alternatives for impacts to the Alabama sturgeon.

- Maintenance of downstream flows (% of days) past R.F. Henry, Millers Ferry and Claiborne Lock and Dams from February 1 to June 30, either over spillways or through locks;
- Efficacy and availability of upstream fish passage facilities and protocols as influenced by each alternative from February 1 to June 30th. (Research on attraction flows and use of locks for aquatic organism passage is ongoing; an analysis of the effect of alternatives on the range of lock operations potentially useful for fish passage would be helpful.)

Freshwater mussels and snails

In the ACT basin water quality criteria, particularly dissolved oxygen, as well as inundation of river bottom habitat are strong predictors of mussel and snail survival and success for all life stages. We will evaluate Corps alternatives for impacts to mussels and snails using the following criteria:

- Total number of days with dissolved oxygen below a daily average of 5 mg/L for benthic sampling locations;
- Total number of instantaneous “measurements” less than 4 mg/L in benthic locations;
- For the Alabama River, total number of days per year with daily mean discharge below 6600 cfs will be used to estimate the potential effect of alternatives on the percent of channel wetted perimeter available for mussels and snails. For the portion of the ACT in Georgia, we are still collecting survey information on the location of extant mussel and snail populations. Where mussels are found, we would be interested in developing estimates of areal percent of the active stream channel remaining in the wetted perimeter for various low flow scenarios.

Floodplain connectivity

- Frequency (% of days) of growing season (April-October) floodplain connectivity (acres) to the main channel using Light et al. (1998);
- Frequency (% of years) of growing season (April-October) floodplain connectivity (acres) to the main channel using Light et al. (1998).
- Corps’ June 6, 2011, response to the Service’s PAL (Appendix V); and

- Corps' November 22, 2011, response to the Service's questions regarding the Corps' June 6, 2011 document (Appendix VI).

Appendix V: Corps' June 6, 2011, response to the Service's PAL.

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, AL 36628-0001

REPLY TO
ATTENTION OF

June 6, 2011

Inland Environment Team
Planning and Environmental Division

Mr. William Pearson
Field Supervisor
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, Alabama 36526

Dear Mr. Pearson:

The enclosed document is in response to your May 3, 2010, Planning Aid Letter (PAL) and e-mailed supplement dated August 13, 2010 for the proposed Water Control Manual (WCM) Updates for the Alabama-Coosa-Tallapoosa River Basin in Georgia and Alabama. In the PAL, you identified the types of data and analyses the U.S. Fish and Wildlife Service (FWS) would need to evaluate the WCM alternatives pursuant to the Fish and Wildlife Coordination Act (FWCA - 48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*). This letter transmits the results of those analyses and/or our response. In addition, we are describing the proposed action and alternatives that are currently proposed to be carried forward for final evaluation in our Environmental Impact Statement (EIS).

Thank you for your assistance thus far in our effort to update these manuals. Based on our review of your letter and this response, we request that you provide us with your Draft FWCA Report at your earliest convenience. We are ready to assist with additional information or analyses. Should you have any questions, comments, or recommendations, please contact Mr. Chuck Sumner, (251) 694-3857, or email: lewis.c.sumner@sam.usace.army.mil.

Sincerely,

T. D. Robison for

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosure

ACT Water Control Manual Update

Response to USFWS Planning Aid Letter dated May 3, 2010

U.S. Army Corps of Engineers, Mobile District

June 3, 2011

Contents

1 Description of the Proposed Action and Alternatives

The Corps proposes to prepare an updated master Water Control Manual (WCM or Master Manual) for the Alabama, Coosa, and Tallapoosa Rivers (ACT) Basin. The component parts of the master WCM would be nine project-level WCMs, presented as appendices. Only two of the four Alabama Power Company (APC) projects in the basin with Corps WCMs will be included in this WCM update. Additional studies would be required for Logan Martin Lake and Weiss Lake to address flood damage reduction prior to updating the manuals at those facilities. The Corps and APC will develop and execute separate Memoranda of Understanding that address only navigation and drought operations for Logan Martin and Weiss Lakes. Operations at those projects will be incorporated in the Master Manual Update.

WCMs contain drought plans and action zones to assist the Corps in knowing when to reduce or increase reservoir releases and conserve storage in the Corps reservoirs. The individual manuals typically outline the regulation schedules for each project, including operating criteria, guidelines, and guide curves, and specifications for storage and releases from the reservoirs. The WCMs also outline the coordination protocol and data collection, management, and dissemination associated with routine and specific water management activities (such as flood-control operations or drought contingency operations). Operational flexibility and discretion are necessary to balance the water management needs for the numerous (and often competing) authorized project purposes at each individual project. In addition, there is a need to balance basin-wide water resource needs. Project operations also must be able to adapt to seasonal and yearly variations in flow and climatic conditions.

The following sections present the No Action Alternative and the Proposed Action Alternative.

1.1 No Action Alternative

The Council on Environmental Quality (CEQ) regulations require analysis of the *No Action Alternative* 40 CFR.1502.14. Inclusion of the No Action Alternative in this Environmental Impact Statement (EIS) complies with CEQ regulations and serves as a benchmark against which federal actions can be evaluated. On the basis of the nature of the proposed action, the No Action Alternative represents no change from the current management direction or level of management intensity. This alternative would represent continuation of the current water control operations at each of the federal projects in the ACT Basin. The Corps' operations have changed incrementally since completion of the 1951 ACT Master Manual. Except in very general terms, it is not possible to describe a single set of reservoir operations that apply to the entire period since completion of the 1951 ACT Master Manual.

Current operations under the No Action Alternative include the following.

- Operations consistent with the Master Manual of 1951 and project-specific WCMs. For the Corps, those manuals and their dates are Lake Allatoona (1993), Carters Lake and Carters Reregulation Dam (1975), Robert F. Henry Lock and Dam (1999), Millers Ferry Lock and Dam (1990), and Claiborne Lake (1993). For APC projects, the applicable manuals and their dates are Weiss Lake (1965), H. Neely Henry Lake, (1979), Logan Martin Lake (1968), and R.L. Harris Lake (2003).
- The Corps recognizes that APC operates 11 dams (10 reservoirs) under six FERC licenses, each one having specific operational requirements: (1) the Coosa River Project (FERC Project No. 2146), which includes the Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, Lay Lake, and Bouldin Dam developments; (2) the Mitchell Lake Project (FERC Project No. 82); (3) the Jordan Dam and Lake Project (FERC Project No. 618); (4) Lake Martin Project (FERC Project No. 349)

(5) Yates Lake-Thurlow Lake (FERC Project No. 2407); and (6) R.L. Harris Lake Project, referred to as Crooked Creek Hydroelectric Project (FERC Project No. 2628). The FERC license for the Coosa River Project was issued in 1957. The FERC license for the Mitchell Lake Project was issued in 1975, and the FERC license for the Jordan Dam and Lake Project was issued in 1980. The licenses for those three projects expired on August 31, 2007. On July 28, 2005, APC applied for one new operating license that would combine all those projects as Project No. 2146. The FERC licenses could be amended in light of APC's request to modify winter pool levels at the Weiss Lake and Logan Martin Lake projects; however, the No Action Alternative does not include such modifications.

- The H. Neely Henry Lake, which operates under a revised guide curve (per a temporary variance initially granted by FERC in 2001 and effective pending relicensing of Project No. 2146), would return to operation under its original guide curve under the current FERC license.
- Specified flow requirements apply to several projects. Lake Allatoona and Carters Lake must provide for a minimum flow of 240 cubic feet per second (cfs). The Corps has a flow target of 6,600 cfs from Claiborne Lake where the actual ability to meet the target depends on releases provided by APC and intervening flows from the Cahaba River and other tributaries. In accordance with a 1972 Letter Agreement between the Corps and APC, APC ensures a combined 4,640-cfs release calculated at Montgomery, Alabama, on the basis of APC releases from JBT, for navigation during normal conditions.
- The Corps provides 6,371 acre-feet (ac-ft) of storage in Lake Allatoona for water supply for the City of Cartersville, Georgia and 13,140 ac-ft for the CCMWA. Total storage allocated to water supply is 19,511 ac-ft.
- The Corps provides 818 ac-ft in Carters Lake for water supply for Chatsworth, Georgia.
- The Corps would continue to manage fish spawning operations at Lake Allatoona, as outlined in District Regulation (DR) 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft Standing Operating Procedure (SOP) *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005). During the largemouth bass spawning period, from March 15 to May 15, the Corps seeks to maintain generally stable or rising reservoir levels at Lake Allatoona. Generally stable or rising levels are defined as not lowering the reservoir levels by more than 6 inches, with the base elevation generally adjusted upward as levels rise from increased inflows or refilling of the reservoir.

The following subsections describe key operational elements that apply to evaluating the No Action Alternative.

1.1.1 General System Operations

The Corps operates its reservoirs in the ACT Basin to provide for the authorized purposes of flood damage reduction, navigation, hydropower, recreation, water supply, water quality, and fish/wildlife. The Corps considers each of those authorized project purposes when making operational decisions, and those decisions affect how water is stored and released from the projects. In general, to provide the authorized project purposes, flow must be stored during wetter times of each year and released from storage during drier periods of each year. Traditionally, that means that water is stored in the lakes during the spring and released for authorized project purposes in the summer and fall months. In contrast, some authorized project purposes such as lakeside recreation, water supply, and lake fish spawning are achieved by retaining water in the lakes, either throughout the year or during specified periods of each year. The flood damage reduction purposes at certain reservoirs requires drawing down reservoirs in the fall through winter months to store possible flood waters and refilling pools in the spring months to be used for multiple project purposes throughout the remainder of the year.

Certain APC projects (Weiss Lake, H. Neely Henry Lake, Logan Martin Lake, and R.L. Harris Lake) are also required to operate for flood damage reduction and navigation. MOUs for each of those APC projects concerning the operation of non-Corps projects have been adopted by the APC and the Corps. WCMs developed for the APC projects are used to guide operations for flood damage reduction and navigation. The MOUs clarify the operational responsibilities of the APC and Corps. Copies of the project MOUs are included in the current WCMs.

The conflicting water demands require that the system be operated in a balanced manner to meet all authorized purposes, while continuously monitoring the total system water availability to ensure that minimum project purposes can be achieved during critical drought periods. The balanced water management strategy for the Corps reservoirs in the ACT Basin does not prioritize any project purpose but seeks to balance all project authorized purposes. The intent is to maintain a balanced use of conservation storage among all the reservoirs in the system, rather than to maintain the pools at or above certain predetermined elevations.

The last major evaluations of the environmental consequences of the individual Corps reservoirs in the ACT Basin were included in project operations EISs completed in the 1970s. Since then, incremental changes in project operations have occurred because of changes in hydropower contracts and operating schedules, changes in navigation flow requirements, and other changes related to water quality, environment, or other uses of the system. Historical records maintained by the Corps illustrate the observed impacts of changes in operations or seasonal variations over time on pool levels and flow releases from Corps reservoirs. Comparing historic operations conditions with existing operations conditions provides a complete picture of the impacts related to changes in water demand and water resources management in the basin as well as a perspective on existing flows to plan for future changes.

1.1.2 Guide Curves and Action Zones

Guide curves define the target amount of water to be held in a reservoir at specified times of the year. Under the No Action Alternative, guide curves would remain as currently defined. Action zones are used to manage the lakes at the highest level possible for recreation and other purposes, meet minimum hydropower needs at each project, and determine the amount of storage available for downstream purposes such as flood damage reduction, hydropower, navigation, water supply, water quality, and recreation. In accordance with Engineer Regulation (ER) 1110-2- 241 *Use of Storage Allocated for Flood Control and Navigation at Non-Corps Projects,* the Corps is responsible for the review and approval of the flood damage reduction plans and Reservoir Regulation Manuals for the APC storage projects Weiss, H. Neely Henry, and Logan Martin Lakes on the Coosa River and R.L. Harris Lake on the Tallapoosa River. The purpose of the reservoir manuals is to define a plan of operation at the reservoirs during the occurrence or threatened occurrence of damaging flood conditions at downstream stations, when such conditions can be alleviated or partially alleviated by the operation of the dam and power plant in the interest of flood damage reduction. In addition, in the 1960s the Corps and APC developed MOUs to clarify the responsibilities of the two entities with regard to operation of the projects for flood damage reduction and other purposes and to provide for the orderly exchange of hydrologic data.

Guide curves have been defined for two of the Corps projects (Carters Lake and Lake Allatoona; and the four APC projects (Weiss, H. Neely Henry, Logan Martin, and R.L. Harris Lakes); no guide curves exist for Claiborne Lake, William “Bill” Dannelly Lake (Millers Ferry Lock and Dam), or R.E. “Bob” Woodruff Lake (Robert F. Henry Lock and Dam). Additionally, action zones have been defined at Lake Allatoona. The zones are used to manage the lake at the highest level possible while balancing the needs of all the authorized purposes. Action Zone 1 is the highest in each lake and defines a reservoir condition where all authorized project purposes should be met. The lake level at the top of Zone 1 is the normal pool level or top of conservation pool (or the guide curve). As lake levels decline, Zone 2 defines increasingly critical system water shortages, and prescribes reductions in reservoir releases as pool levels drop as a result of drier than normal or drought conditions. The action zones also provide guidance on meeting minimum hydropower needs at each project as well as determining 1 the minimum releases for downstream purposes such as water supply and water quality. Under the No Action Alternative, the current guide curve and action zones (at Lake Allatoona) would continue to serve as the basis for Corps management of the reservoir. Figures 1.1-1 through 1.1-6 show the annual guide curves and action zones for pertinent Corps and APC projects. Each of the figures for the APC projects (Figures 1.1-3 through 1.1-6) depict a *drought curve*. Those drought curves have been established by APC for their drought operations under their Alabama Power Company Drought Operations Plan (APCDOP). Although used by APC for general planning, their drought curves have not been adopted by the Corps as part of the No Action alternative.

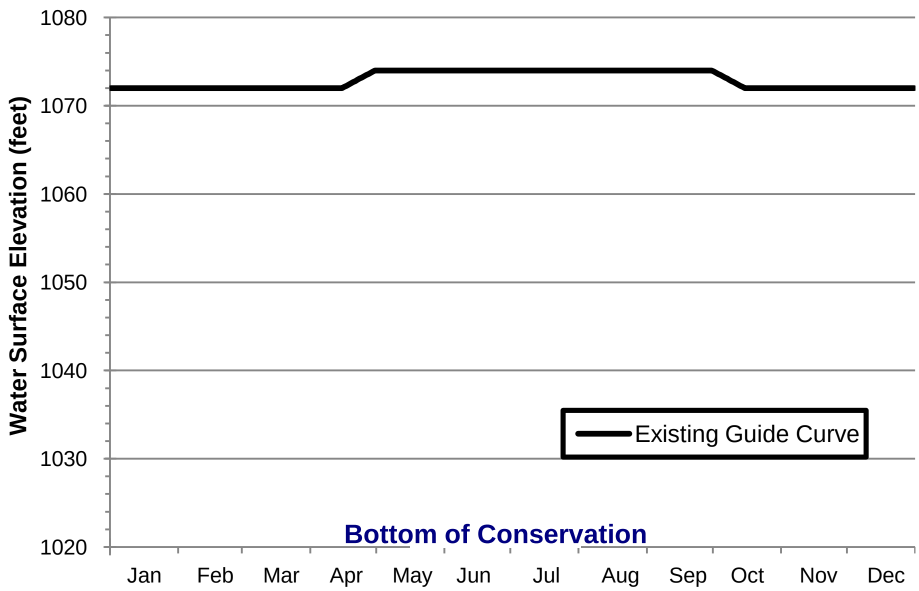


Figure 1.1-1. Carters Lake guide curve.

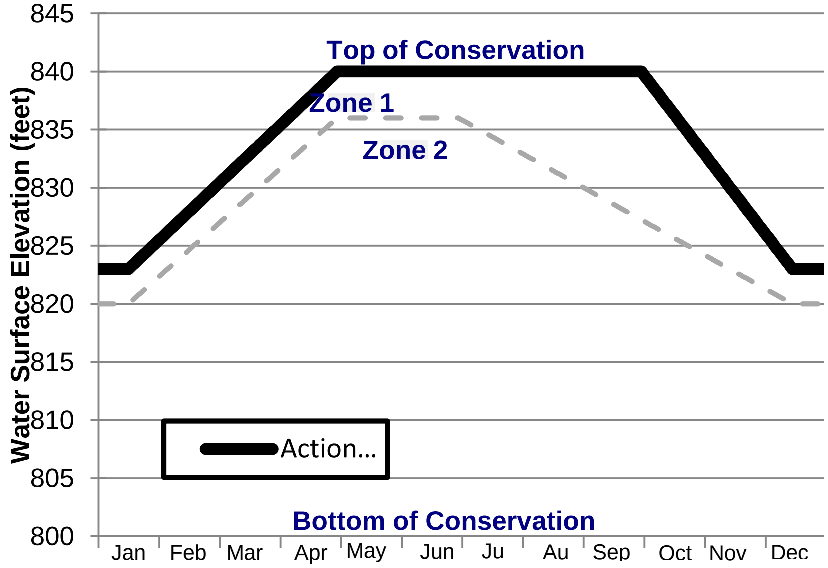


Figure 1.1-2 Lake Allatoona guide curves and action zones.

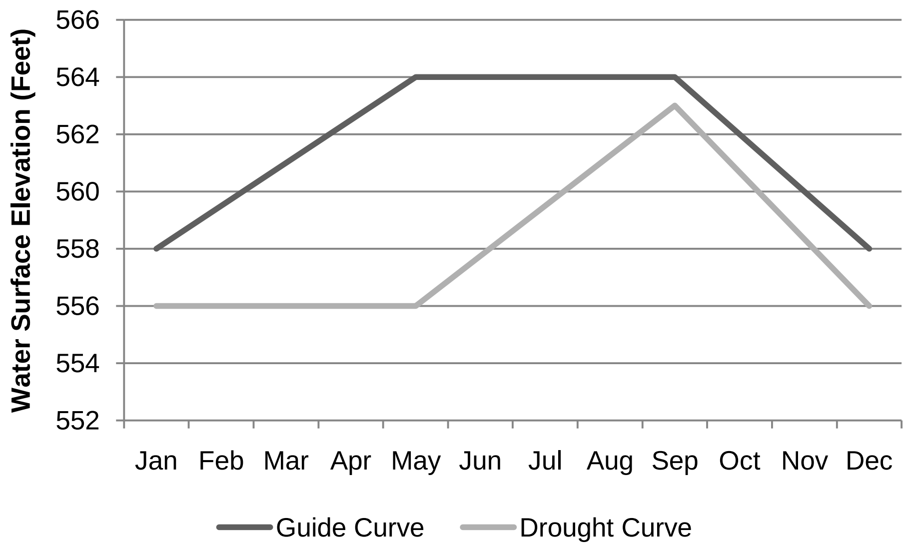


Figure 1.1-3 Weiss Lake guide curves.

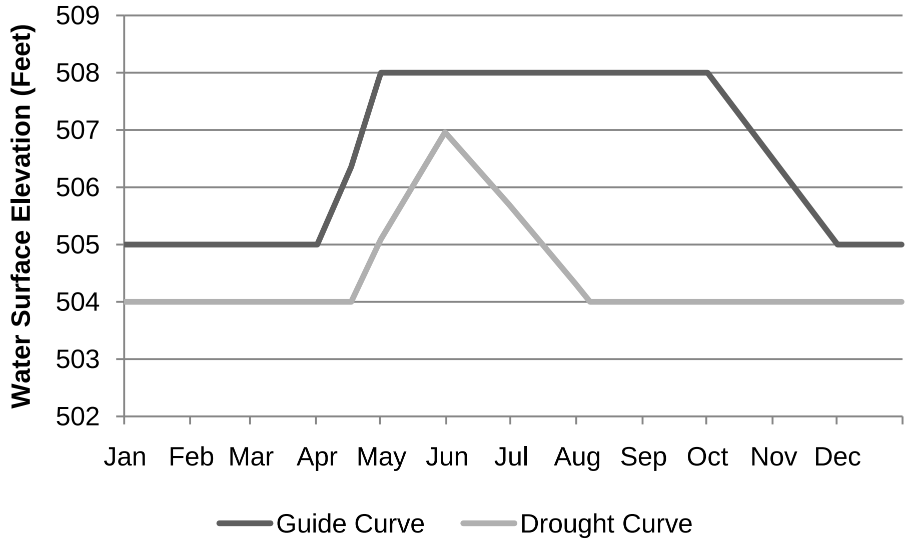


Figure 1.1-4 H. Neely Henry Lake guide curves.

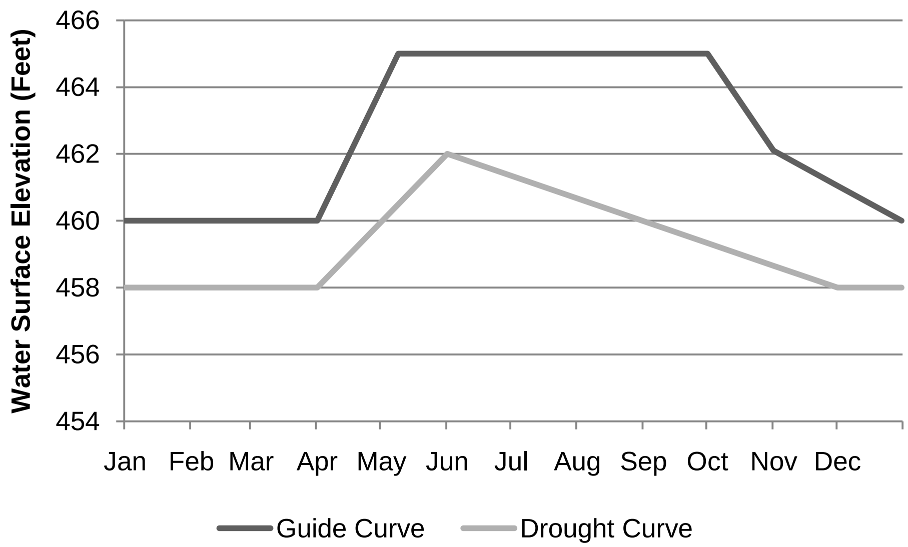


Figure 1.1-5 Logan Martin Lake guide curves.

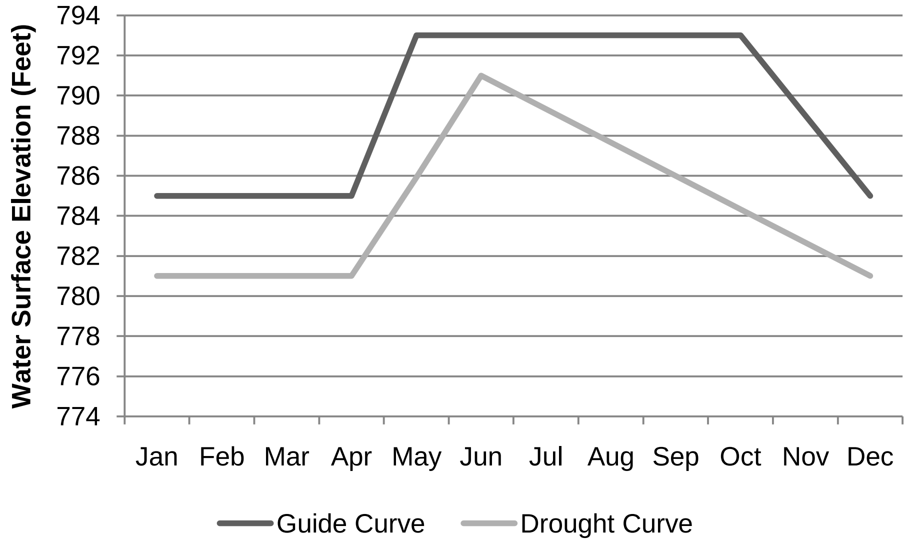


Figure 1.1-6 R.L. Harris Lake guide curves.

1.2 Proposed Action Alternative

Under the Proposed Action Alternative, the Corps would continue to operate federal projects in the ACT Basin in a balanced manner to achieve all authorized project purposes. Operations under the Proposed Action Alternative include the following.

- Implement a revised APCDOP with enhancements recommended by the USFWS. The revised APCDOP with USFWS enhancement is depicted in Table 1.2-1.
- Provide for seasonal navigation releases, coupled with seasonal maintenance dredging, to support commercial navigation in the Alabama River for a 9.0-ft or 7.5-ft channel depth as long as sufficient basin inflow above the APC projects is available. When sufficient flows cannot be provided to continue to support a minimum 7.5-ft navigation channel, navigation would be suspended and flows at Montgomery would be reduced to 4,640 cfs (7Q10) or lower if one or more of the drought operations triggers (low basin inflows, low composite conservation storage, or low state line flows) would be exceeded. APC projects on the Coosa and Tallapoosa Rivers would continue to operate under their current FERC licenses with specific operational requirements. FERC relicensing actions are underway for the Coosa River projects, and APC has requested to modify winter pool levels at the Weiss Lake and Logan Martin Lake projects. The Proposed Action Alternative does not include those proposed modifications by APC.
- The APC project, H. Neely Henry Lake (Coosa River), which operates with a revised guide curve under a FERC license variance (with Corps concurrence) would continue to operate under its revised guide curve (Figure 1.2-1).
- Specified flow requirements at Lake Allatoona would continue to provide for a 240-cfs minimum flow.
- The existing guide curve at Lake Allatoona would be revised to implement a phased fall drawdown period from early September through December (Figure 1.2-2). Refined operations at Lake Allatoona would include use of four action zones shaped to mimic the seasonal demands for hydropower (Figure 1.2.2). Modifications to the hydropower schedule would be put in place to provide greater operational flexibility to meet power demands while conserving storage. Specifically, under the Proposed Action Alternative, hydropower generation would be reduced during annual drawdown in the fall (September through October).
- The current minimum flow requirement would remain at 240 cfs from Carters Reregulation Dam. Refined operations at Carters Lake would include the use of two action zones to manage downstream releases. The top of the new Zone 2 begins at elevation 1,066 ft in January, increasing to 1,070.5 ft in May, dropping to 1,070 ft by October, and returning to elevation 1,066 ft through December (Figure 1.2-3). When Carters Lake is in Zone 1, minimum flow releases at Carters Reregulation Dam would be equal to the seasonal minimum flow. Those minimum flow releases are based on the mean monthly flow upstream of Carters Lake. If Carters Lake elevation drops into Zone 2, minimum flow releases from the Carters Reregulation Dam would be 240 cfs.
- The Corps provides 6,371 ac-ft of storage in Lake Allatoona for water supply for the City of Cartersville, Georgia and 13,140 ac-ft for the CCMWA. Total storage allocated to water supply is 19,511 ac-ft.
- The Corps provides 818 ac-ft in Carters Lake for water supply for the City of Chatsworth, Georgia.
- The Corps would continue to manage fish spawning operations at Lake Allatoona, as outlined in DR 1130-2-16, *Project Operations, Lake Regulation and Coordination for Fish Management Purposes* and draft SOP *Reservoir Regulation and Coordination for Fish Management Purposes* (Mobile District SOP 1130-2-9, draft, February 2005). During the largemouth bass spawning period, from March 15 to May 15, the Corps seeks to maintain generally stable or rising reservoir levels at Lake Allatoona. Generally stable or rising levels are defined as not lowering the

reservoir levels by more than 6 inches, with the base elevation generally adjusted upward as levels rise from increased inflows or refilling of the reservoir.

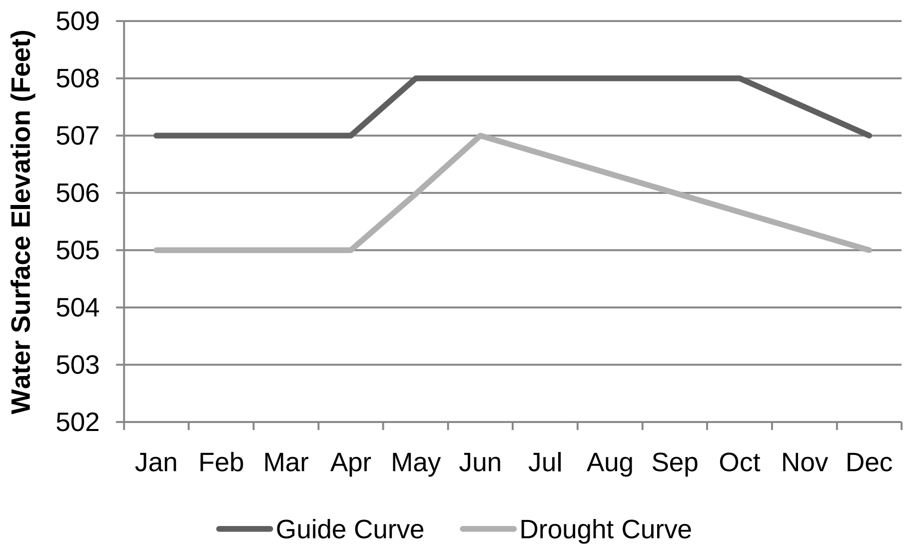


Figure 1.2-1 H. Neely Henry Lake revised guide curve.

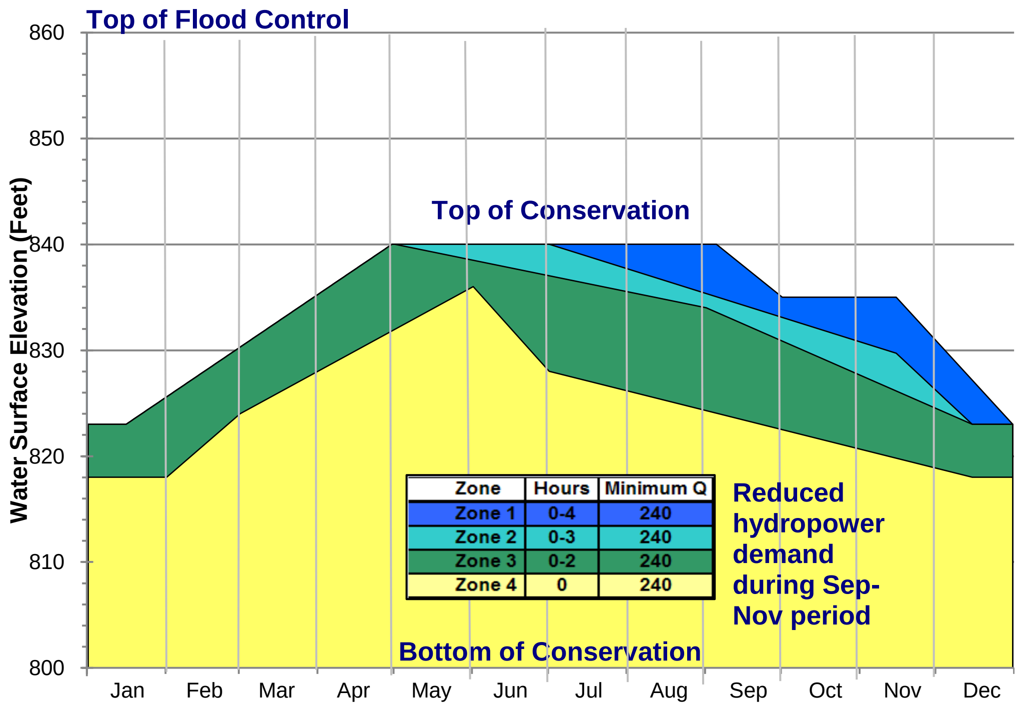


Figure 1.2-2 Operations under the Proposed Action Alternative at Lake Allatoona.

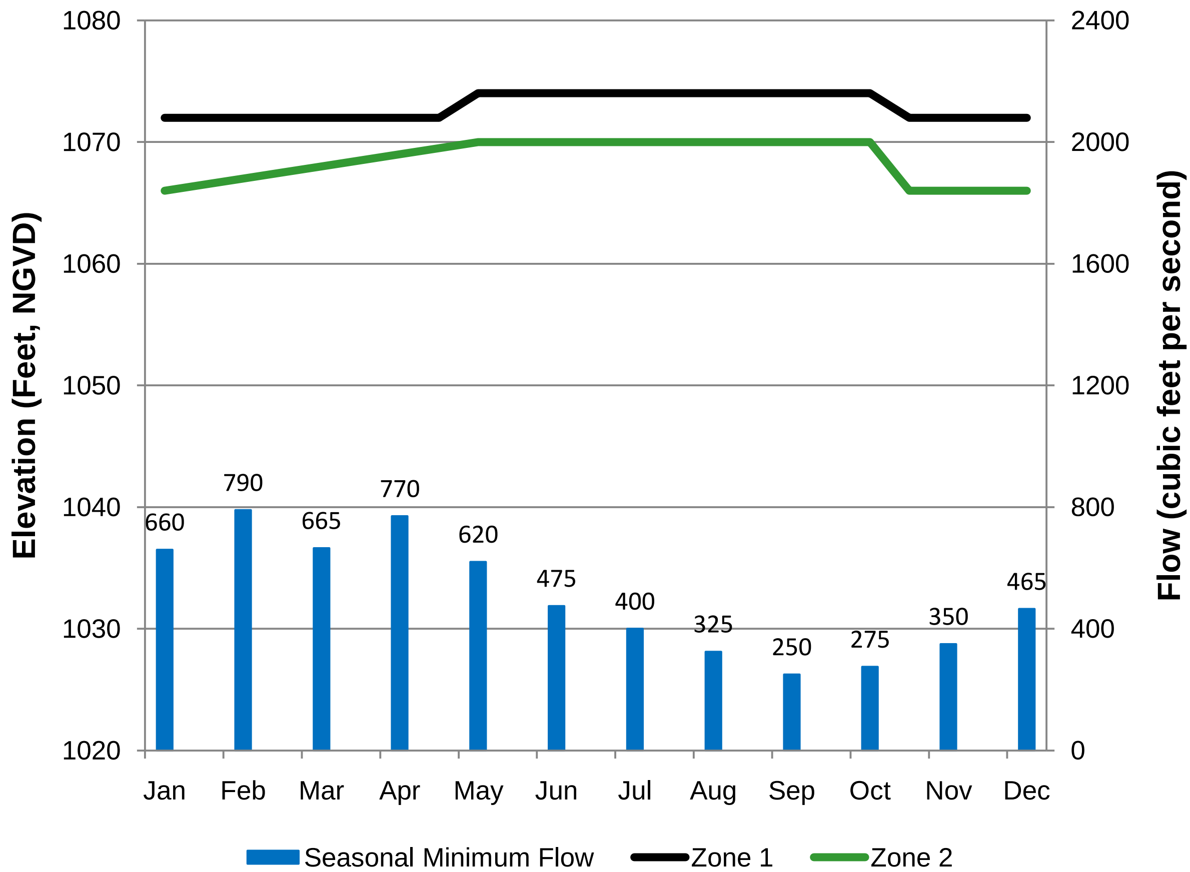


Figure 1-2.3 Carters Lake modified action zones.

1.2.1 Drought Management Plan

Both Alabama and Georgia have general statewide drought plans. Management measures to establish a drought management plan for the ACT basin were considered to meet the objectives to develop a drought management plan as required by Corps regulations and to incorporate changes made at APC projects into operations of the ACT Basin in the updated WCM. APC manages about 78 percent of the water stored in the ACT Basin.

During the drought of 2006–2008, the Corps did not have a drought plan applicable across the entire ACT Basin. The Corps generally responded to drought conditions by reducing hydropower generation at Lake Allatoona and Carters Lake as the reservoir pools dropped throughout the summer and fall. During previous droughts, the Corps coordinated frequently with APC, the states, and affected stakeholders—and the drought of 2006–2008 was no exception. During the drought, the Corps conducted biweekly water management conference calls with stakeholders from across the basin to gather information to better inform water management decision making. The Corps also supported, to a limited extent, an APC request to reduce the 4,640-cfs flow target at Montgomery by 20 percent (to 3,900 cfs).

In response to the 2006–2008 drought, APC worked closely with Alabama to develop the APC draft *Alabama Drought Operations Plan* (APCDOP) that specified operations at APC projects on the Coosa and Tallapoosa Rivers. That plan included the use composite system storage, state line flows, and basin inflow as triggers to drive drought response actions. Similarly, in response to the 2006–2008 drought, the Corps recognized that a basin-wide drought plan must incorporate variable hydropower generation requirements from its headwater projects in Georgia (Lake Allatoona and Carters Lake), a reduction in the level of navigation service provided on the Alabama River as storage across the basin declines, and that environmental flow requirements must still be met to the maximum extent practicable.

Building on the APCDOP and APC experience applying it to project operations, the Corps sought, in cooperation with APC, to develop a basin-wide drought plan composed of three components—headwater operations at Lake Allatoona and Carters Lake in Georgia; operations at APC projects on the Coosa and Tallapoosa Rivers; and downstream operations at Corps projects below Montgomery. The concept is graphically depicted in Figure 1.2-4 below.

1.2.1.1 Headwater Operations for Drought at Lake Allatoona and Carters Lake

Drought operations at Carters Lake and Lake Allatoona would consist of progressively reduced hydropower generation as pool levels decline. For instance, when Lake Allatoona is operating in normal conditions (Zone 1 operations), hydropower generation might be 0 to 4 hours per day. However, as the pool drops to lower action zones during drought conditions, generation could be reduced to 0 to 2 hours per day. As Carters Lake pool level might drop into a newly created Zone 2, minimum target flows would be reduced from seasonal varying values to 240 cfs.

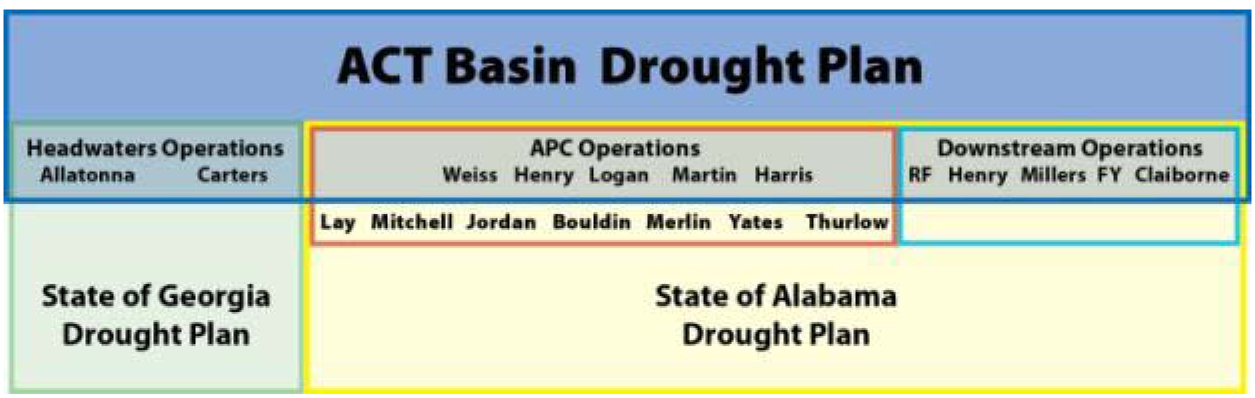


Figure 1.2-4 Schematic of the ACT Basin drought plan.

1.2.1.2 Operations at APC Projects on the Coosa, Tallapoosa, and Alabama Rivers

Under current operations, APC provides a minimum flow at Montgomery, Alabama, of 4,640 cfs (7-day average) based on the combined flows from the Tallapoosa and Coosa Rivers. The minimum flow target of 4,640 cfs was originally derived from the7Q10 flow at Claiborne Lake of 6,600 cfs. Those flows were established with the understanding that if APC provided 4,640 cfs, the Corps and intervening basin inflow would be able to provide the remaining water to meet 6,600 cfs at Claiborne Lake. As dry conditions continued in 2007, water managers understood that, if the basin inflows from rainfall were insufficient, the minimum flow target would not likely be achievable. With that understanding, the Corps considered updating drought operations in coordination with APC.

The APCDOP, described in the following paragraphs, served as the initial template for developing proposed drought operations for the ACT Basin. APCDOP operational guidelines for the Coosa, Tallapoosa, and Alabama Rivers have been defined in a matrix, on the basis of a Drought Intensity Level (DIL). The DIL is a drought indicator, ranging from zero to three. The DIL is determined on the basis of three basin drought criteria (or triggers). A DIL=0 indicates normal operations, while a DIL from 1 to 3 indicates some level of drought conditions. The DIL increases as more of the drought indicator thresholds (or triggers) are exceeded. The APCDOP matrix defines monthly minimum flow requirements for the Coosa, Tallapoosa, and Alabama Rivers as function of DIL and time of year. Such flow requirements are modeled as daily averages.

The combined occurrences of the drought triggers determine the DIL. Three intensity levels for drought operations are applicable to APC projects.

- DIL0—(normal operation) no triggers exceeded
- DIL1—(moderate drought) 1 of 3 triggers exceeded
- DIL2—(severe drought) 2 of 3 triggers exceeded
- DIL3—(exceptional drought) all 3 triggers exceeded

The indicators used in the APCDOP to determine drought intensity include the following:

1. Low basin inflow
2. Low composite conservation storage
3. Low state line flow

Each of those indicators is described in detail in Sections 1.2.2.3 through 1.2.2.5, below.

The DIL would be computed on the 1st and 15th of each month. Once a drought operation is triggered, the DIL can only recover from drought condition at a rate of one level per period. For example, as the system begins to recover from an exceptional drought with DIL=3, the DIL must be stepped incrementally back to zero to resume normal operations. In that case, even if the system triggers return to normal quickly, it will still take at least a month before normal operations can resume—conditions can improve only to DIL=2 for the next 15 days, then DIL=1 for the next 15 days, before finally returning to DIL=0.

For DIL=0, the matrix (Table 1.2-1) 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, part of the year, the required flow is the greater of one-half of the inflow into Yates Lake and twice the Heflin USGS gage. 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 when DIL=0.

For DIL=2, the Coosa River flow varies from 1,800 cfs to 2,500 cfs. On the Tallapoosa River, the minimum is 350 cfs for part of the year and one-half of Yates Lake inflow for the remainder of the year. The requirement on the Alabama River is between 3,700 cfs and 4,200 cfs.

For DIL=3, the flows on the Coosa River range from 1,600 cfs to 2,000 cfs. A constant flow of 350 cfs on the Tallapoosa River is required. It is assumed an additional 50 cfs will occur between Thurlow Lake and the City of Montgomery water supply intake. Required flows on the Alabama River range from 2,000 cfs to 4,200 cfs.

In addition to the APCDOP, the DIL affects the navigation operations. When the DIL is equal to zero, APC projects are operated to meet navigation flow target or the 7Q10 flow as defined in the navigation measure section. Once DIL is greater than zero, drought operations will occur, and navigation operations are suspended.

Table 1.2-1
APCDOP with USFWS enhancements

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Drought Level Response[a]	DIL 0 - Normal Operations											
	DIL 1: Low Basin Inflows or Low Composite or Low State Line Flow											
	DIL 2: DIL 1 criteria + (Low Basin Inflows or Low Composite or Low State Line Flow)											
	DIL 3: Low Basin Inflows + Low Composite + Low State Line Flow											
Coosa River Flow[b]	Normal Operation: 2,000 cfs			4,000 (8,000)		4,000 – 2,000	Normal Operation: 2,000 cfs					
	Jordan 2,000 +/-cfs			4,000 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 2,000 +/-cfs		
	Jordan 1,800 +/-cfs			2,500 +/- cfs		6/15 Linear Ramp down	Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		
	Jordan 1,600 +/-cfs			Jordan 1,800 +/-cfs			Jordan 2,000 +/-cfs			Jordan 1,800 +/-cfs		Jordan 1,600 +/- cfs
Tallapoosa River Flow[c]	Normal Operations: 1200 cfs											
	Greater of: 1/2 Yates Inflow or 2 x Heflin Gage(Thurlow Lake releases > 350 cfs)				1/2 Yates Inflow					1/2 Yates Inflow		
	Thurlow Lake 350 cfs				1/2 Yates Inflow					Thurlow Lake 350 cfs		
	Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)						Thurlow Lake 350 cfs			Maintain 400 cfs at Montgomery WTP (Thurlow Lake release 350 cfs)		
Alabama River Flow[d]	Normal Operation: Navigation flow (4,640 cfs)											
	4,200 cfs (10% 7Q10 Cut) - Montgomery				Full Navigation - Montgomery (4,640 cfs)					Reduce: Full – 4,200 cfs		
	3,900 cfs (20% 7Q10 Cut) - Montgomery				4,200 cfs (10% 7Q10 Cut) – Montgomery					Reduce: 4,200 cfs-> 3,900 cfs Montgomery		
	2,000 cfs Montgomery				3,900 cfs Montgomery		4,200 cfs (10% 7Q10 Cut) - Montgomery			Reduce: 4,200 cfs -> 2,000 cfs Montgomery (ramp thru October)		
Guide Curve Elevation	Normal Operations: Elevations follow Guide Curves as prescribed in License (Measured in Feet)											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											
	Corps Variances: As Needed; FERC Variance for Lake Martin											

a. Note these are based flows that will be exceeded when possible.
b .Jordan flows are based on a continuous +/- 5% of target flow.
c. Thurlow Lake flows are based on continuous +/- 5% of target flow: flows are reset on noon each Tuesday based on the prior day's daily average at

Heflin or Yates. d. Alabama River flows are 7-Day Average Flow.

1.2.1.3 Low Basin Inflow Trigger

The total basin inflow needed for navigation is the sum of the total filling volume plus 7Q10 flow (4,640 cfs). Table 1.2-2 lists the monthly low basin inflow criteria. All numbers are in cfs-days. The basin inflow value is computed daily and checked on the 1st and 15th of the month. If computed basin inflow is less than the value required, the low basin inflow indicator is triggered.

The basin inflow is total flow above the APC projects excluding Lake Allatoona and Carters Lake. It is the sum of local flows, minus lake evaporation and diversions. Figure 1.2-5 illustrates the local inflows to the Coosa and Tallapoosa basin. The basin inflow computation differs from the navigation basin inflow, because it does not include releases from Lake Allatoona and Carters Lake. The intent is to capture the hydrologic condition across APC projects in the Coosa and Tallapoosa basins.

Table 1.2-2
Low basin inflow guide (in cfs-days)

Month	Coosa Filling Volume	Tallapoosa Filling Volume	Total Filling Volume	7Q10 flow	Required Basin Inflow
Jan	629	0	629	4,640	5,269
Feb	647	1,968	2,615	4,640	7,255
Mar	603	2,900	3,503	4,640	8,143
Apr	1,683	2,585	4,268	4,640	8,908
May	242	0	242	4,640	4,882
Jun			0	4,640	4,640
Jul			0	4,640	4,640
Aug			0	4,640	4,640
Sep	–602	–1,304	–1,906	4,640	2,734
Oct	–1,331	–2,073	–3,404	4,640	1,236
Nov	–888	–2,659	–3,547	4,640	1,093
Dec	–810	–1,053	–1,863	4,640	2,777

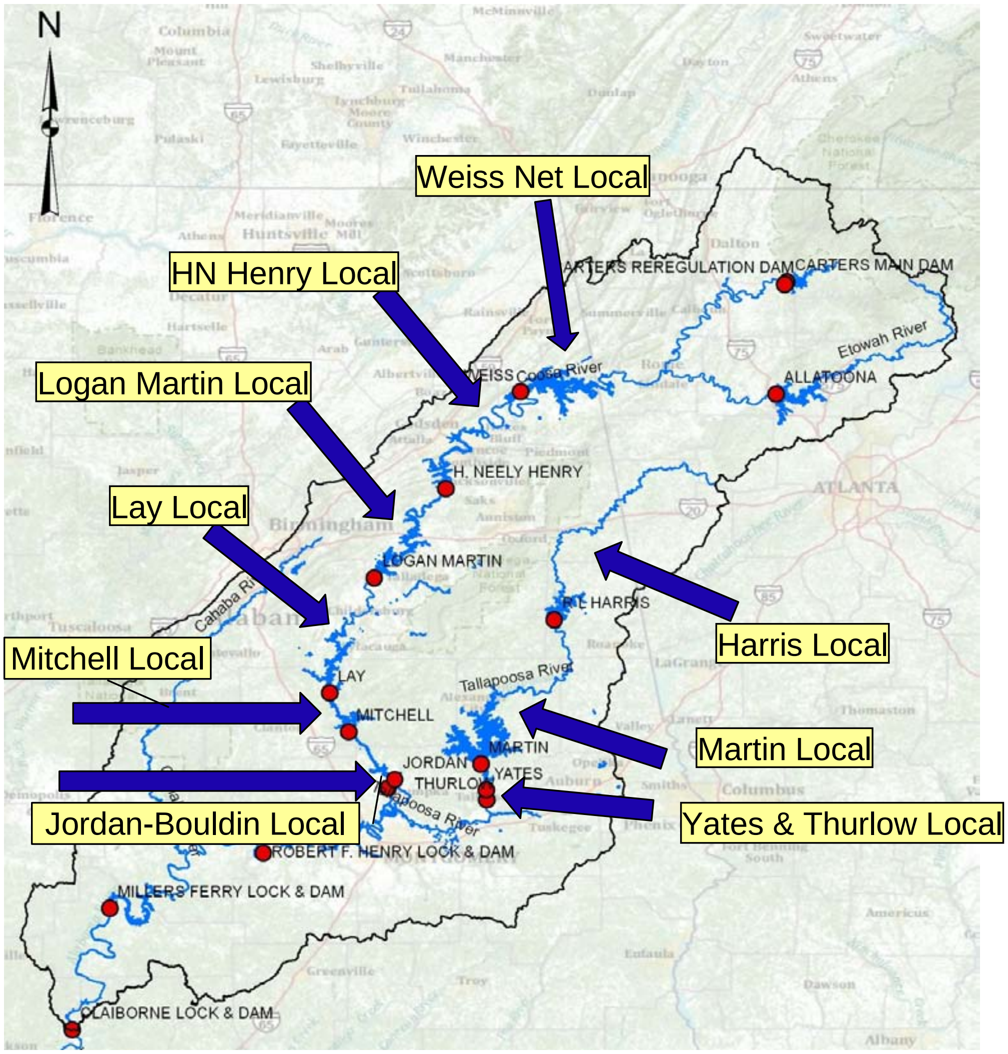


Figure 1.2-5 ACT Basin inflows.

1.2.1.4 State Line Flow Trigger

A low state line flow trigger occurs when the Mayo's Bar USGS gage measures a flow below the monthly historical 7Q10 flow. The 7Q10 flow is defined as the lowest flow over a 7-day period that would occur once in 10 years. Table 1.2-3 lists the Mayo's Bar 7Q10 value for each month. The lowest 7-day average flow over the past 14 days is computed and checked at the 1st and 15th of the month. If the lowest 7-day average value is less than the Mayo's Bar 7Q10 value, the low state line flow indicator is triggered. If the result is greater than or equal to the trigger value from Table 4.2-5, the flow is considered normal, and the state line flow indicator is not triggered. The term *state line flow* is used in developing the drought management plan because of the proximity of the Mayo's Bar gage to the Alabama-Georgia state line and because it relates to flow data upstream of the Alabama-based APC reservoirs. State line flow is used only as a source of observed data for one of the three triggers and does not imply that *targets* exist at that geographic location. The APCDOP does not include or imply any Corps operation that would result in water management decisions at Carters Lake or Lake Allatoona.

Table 1.2-3
State line flow trigger

Month	Mayo's Bar (7Q10 in cfs)
Jan	2,544
Feb	2,982
Mar	3,258
Apr	2,911
May	2,497
Jun	2,153
Jul	1,693
Aug	1,601
Sep	1,406
Oct	1,325
Nov	1,608
Dec	2,043

Note: Based on USGS Coosa River at Rome Gage (Mayo's Bar, USGS 02397000) observed flow from 1949 to 2006

1.2.1.5 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, Lake Martin, and Weiss Lake projects. Figure 1.2-6 plots the APC composite zones. Figure 1.2-7 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 one storage, the low composite conservation storage indicator is triggered. That computation is performed on 1st and 15th of each month, and is compared to the low state line flow trigger and basin inflow trigger.

1.2.1.6 Operations for Corps Projects Downstream of Montgomery

Drought operations of the Corps' Alabama River projects (R.E. "Bob" Woodruff Lake [Robert F. Henry Lock and Dam], and William "Bill" Dannelly Lake [Millers Ferry Lock and Dam]) will respond to drought operation of the APC projects. When combined releases from the APC projects are reduced to the 7Q10 flow of 4,640 cfs, the Corps' Alabama River projects will operate to maintain a minimum flow of 6,600 cfs below Claiborne Lake. When the APCDOP requires flows less than 4,640 cfs, the minimum flow at Claiborne Lake is equal to the inflow into Millers Ferry Lock and Dam. 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.

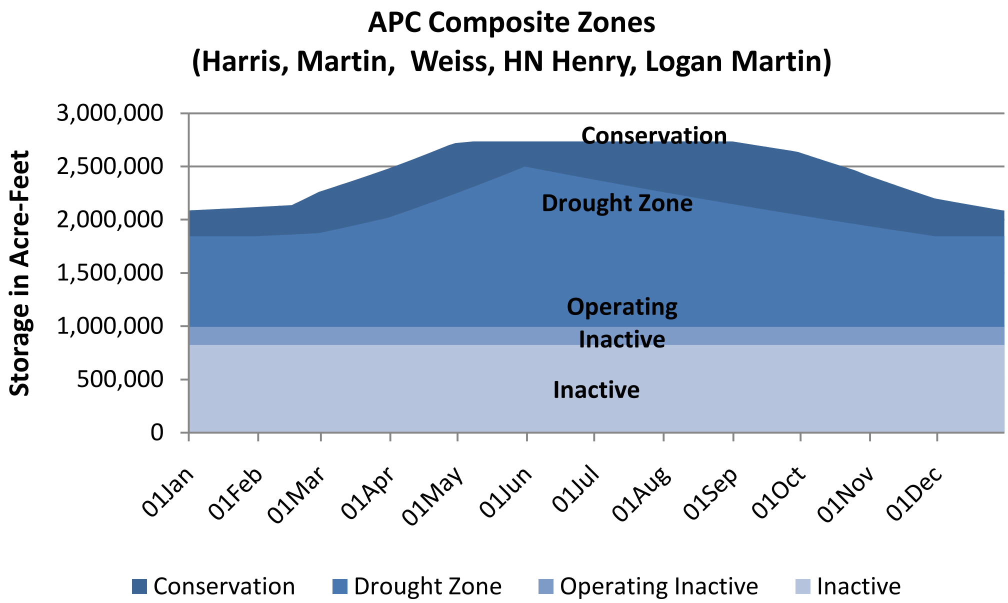


Figure 1.2-6 APC composite zones.

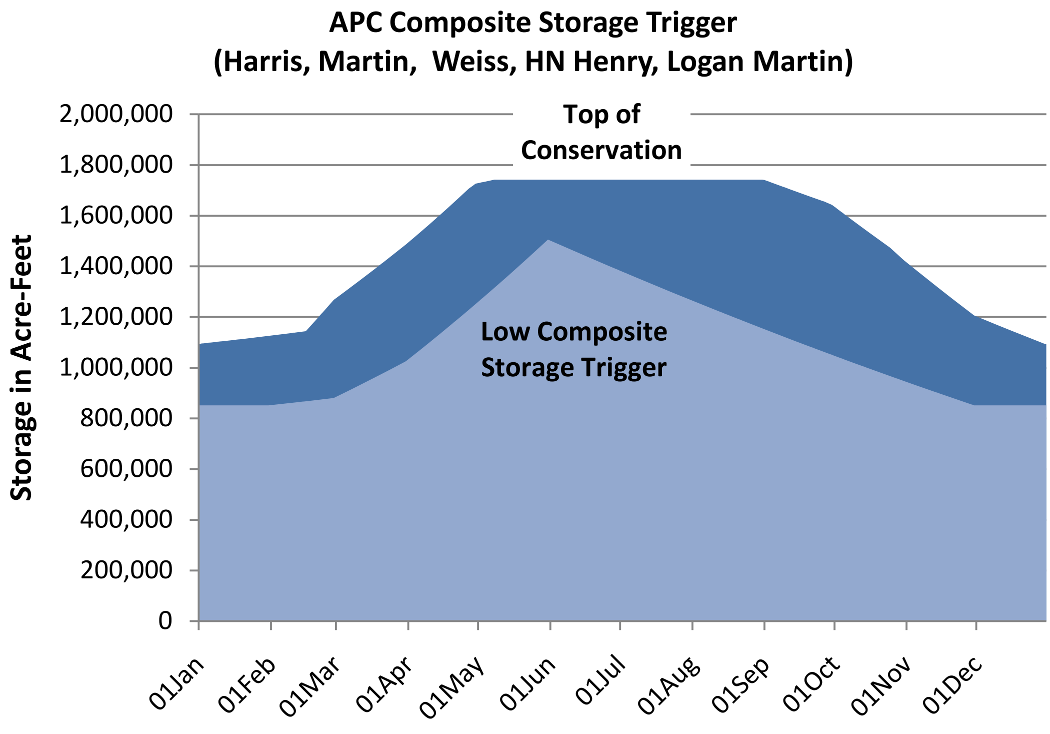


Figure 1.2-7 APC low composite conservation storage drought trigger.

2 RESPONSE TO PLANNING AID LETTER (PAL)

2.1 Low DO below reservoirs and meeting of State water quality standards.

In accordance with ER 1110-2-8154, *Water Quality and Environmental Management for Corps Civil Works Projects*, the Corps has an objective to ensure that water quality, as affected by a Corps project and its operation, is suitable for project purposes, existing water uses, and public safety and is in compliance with applicable federal and state water quality standards. The States currently monitor data throughout the summer low-flow period in reservoirs to ensure water quality standards are met.

Water quality was taken into account when updating water control plans and manuals. The information contained in the following sections demonstrates the effects of the No Action Alternative and Preferred Alternative on water quality.

HEC-ResSim model is being used to simulate flow operations in the ACT Basin. HEC-ResSim is a state-of-the-art tool for simulating flow operations in managed systems. It was developed by the Corps' Hydrologic Engineering Center (HEC) to help engineers and planners perform water resources studies in predicting the behavior of reservoirs and to help reservoir operators plan releases in real-time during day-to-day and emergency operations. Version 3.0 of the HEC-ResSim model was released in April 2007. The Corps HEC also developed HEC-5Q to provide an analytic tool for evaluating the water quality response. This model is linked with the HEC-ResSim model through an input of flows by reach. For this EIS, the enhanced HEC-5Q developed for the Columbia River Basin was generalized and improved to evaluate the effects of ACT project operations on basin water quality. The HEC-5Q model was linked with the HEC-ResSim model through an input of flows by reach to examine the effects on water quality in the mainstems of the ACT Basin. The HEC-5Q results presented in this section are for the modeled period (2001–2008).

The purpose of simulating conditions over this period (2001 – 2008) was not to capture historical changes in water quality; rather, the intent was to capture the range of potential hydrologic conditions that influence water quality. The modeled period includes wet, dry, and normal rainfall conditions, which allows a display of the water quality response to varying hydrologic conditions. The wet, dry, and normal rainfall years presented are 2003, 2007, and 2002, respectively. Those years were selected to represent the range of hydrologic conditions that can occur understanding that conditions can vary greatly over the entire basin.

The sections to follow present the change (or *delta*) in various modeled parameters between the No Action Alternative, Plan D, Plan F, and the Proposed Action Alternative. These four alternatives have been evaluated in detail; however, for the purpose of this response, only the Proposed Action Alternative will be described. The longitudinal occurrence profiles by rivermile (RM) illustrate how water quality varies along the reach, and how water quality might be affected by dams, other structures, or discharges from point and nonpoint sources. Presenting data in such a way illustrates the amount of time a concentration is higher or lower than a given value. In those plots, the 5th, 50th (or median), and 95th percent occurrences are illustrated. Those percentiles illustrate the range of concentrations that would be likely to occur. Such profiles illustrate the percentage of time a concentration of pollutant occurs as a *Percent Occurrence* at stations in mainstem sections of the ACT Basin.

The median values reflect the points at which 50 percent of the calculated values are higher and 50 percent are lower. The 95th percent occurrence and 5th percent occurrence bracket the range of high and low calculated values that rarely occur. For example, a DO plot showing a 5 percent occurrence level at 5 mg/L means that 5 percent of the observations were lower than that concentration. An occurrence level of 95 percent at 12 mg/L shows that 95 percent of modeled concentrations fell below 12 mg/L. Conversely, that would indicate that 5 percent of the model values were higher than 12 mg/L. Presenting modeled results that way should help readers understand the response of the system without allowing the data from extreme events to skew the results. Note that the percent occurrence is the opposite of the percent exceedence.

It is also important to understand that critical conditions for water quality parameters vary under different flow and water temperature conditions. For example, water temperatures increase in warm weather months and in low stream flow conditions. In wet weather conditions, nutrient concentrations may increase. For this reason water quality conditions are defined for representative wet, dry, and normal weather conditions. State and federal agencies also define warm weather months, or the *growing season*, in different ways for regulatory purposes. The figures to follow illustrate annual conditions as well as growing seasons defined by May through October and April through November.

2.1.1 Total number of days with dissolved oxygen (DO) below a daily average of 5.0 mg/L

The total number of days with a daily average DO less than 5.0 mg/L was not calculated. However, the occurrence of DO was plotted and compared between alternatives at various locations in the basin. In general, the proposed operational changes would be expected to have a negligible effect on DO for much of the ACT Basin. In the figures presented below, the results generally overlay each other, and the differences between alternatives are indistinguishable. As described in the PAL, the lowest DO concentrations occur in dam tailraces. Despite low concentrations of dissolved oxygen in dam tailraces, the Proposed Action Alternative generally is equal to the No Action Alternative as illustrated in Figures 2.2-1 through 2.2-5.

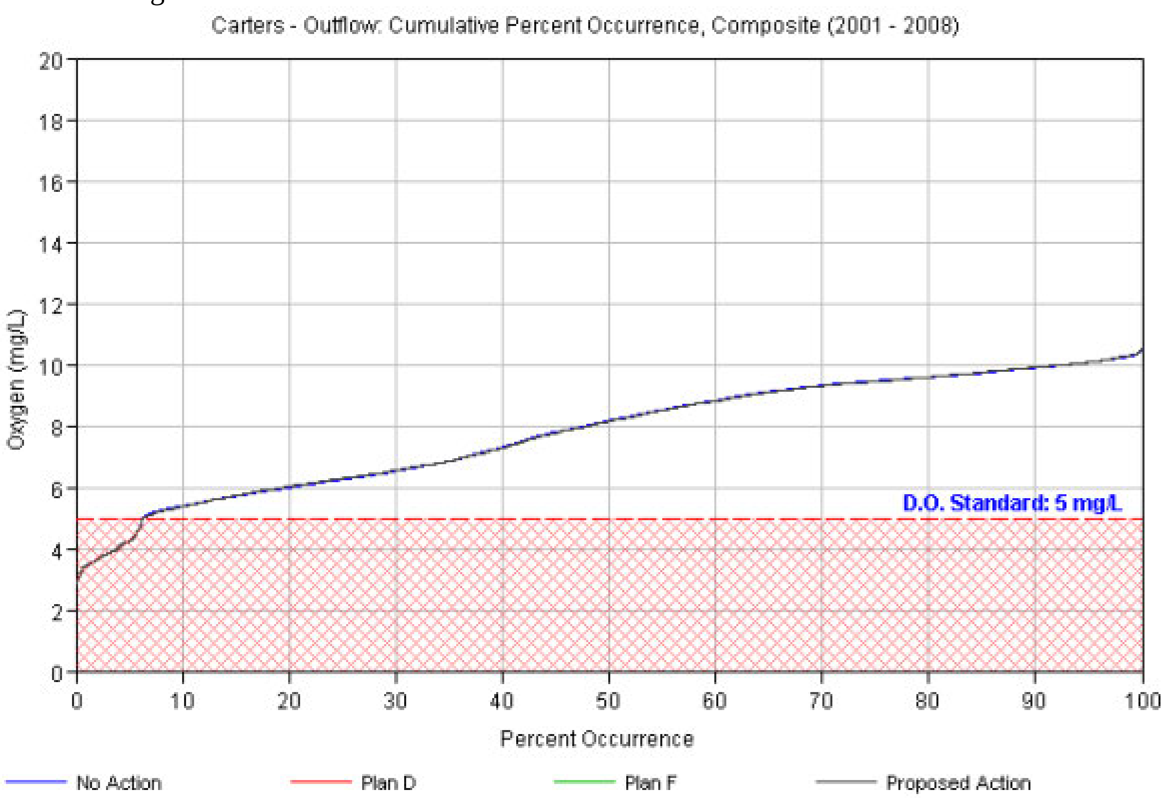


Figure 2.1-1 Carters Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

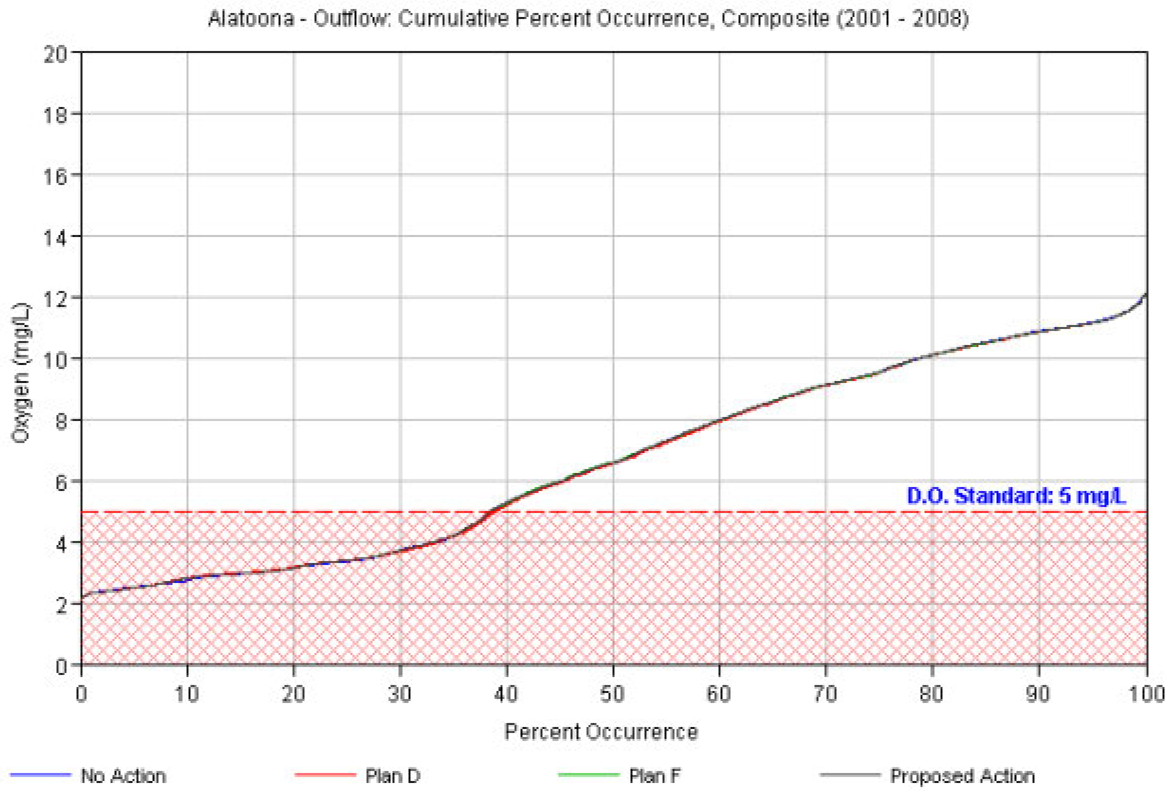


Figure 2.1-2 Allatoona Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

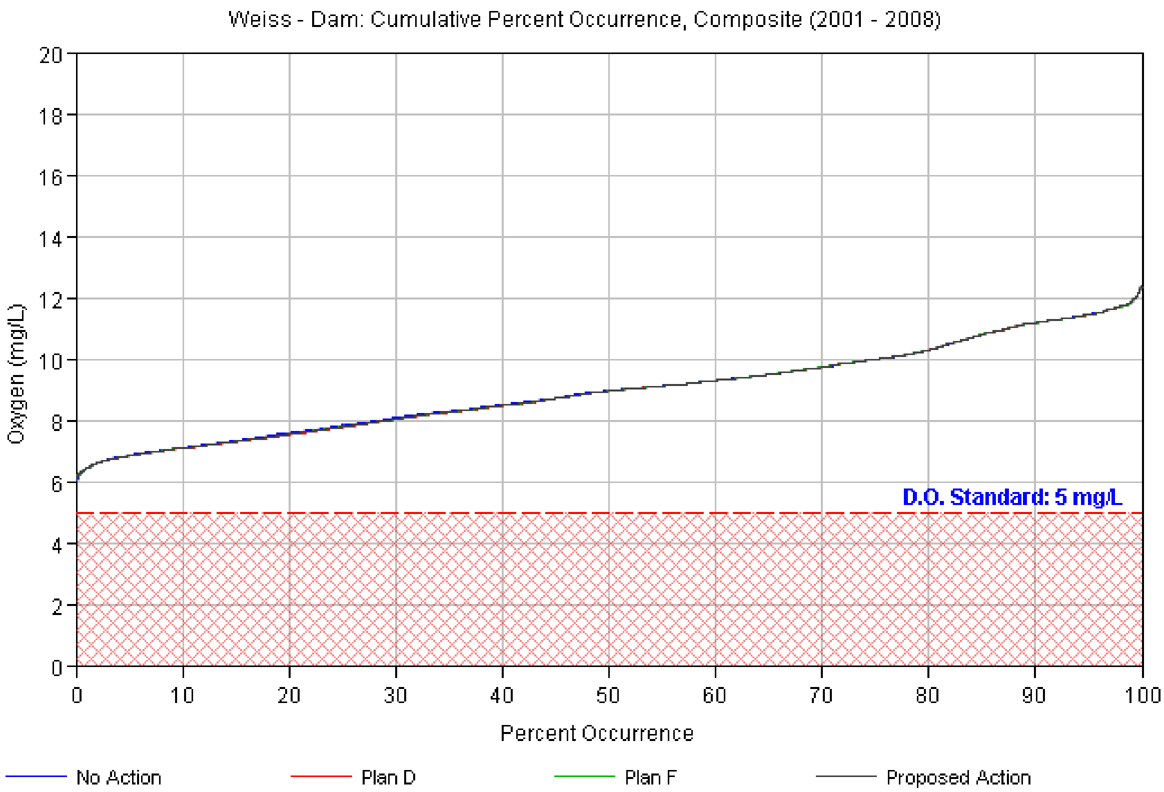


Figure 2.1-3 Weiss Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

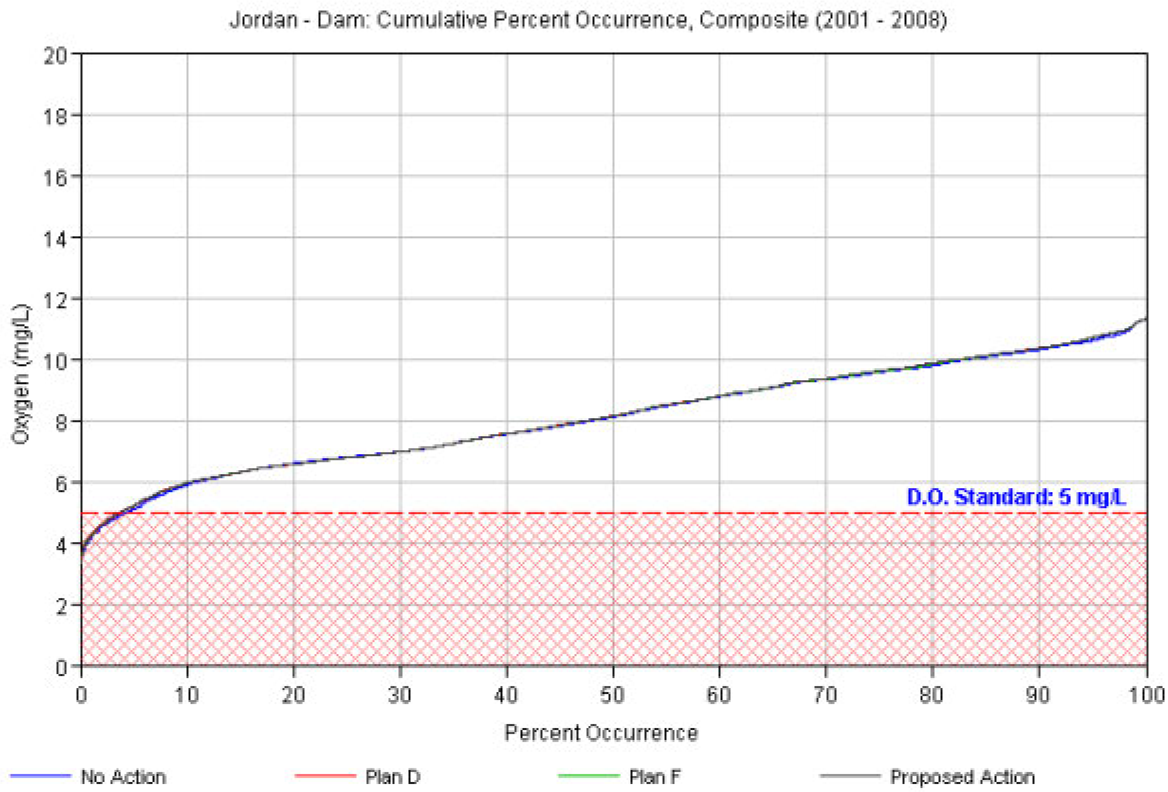


Figure 2.1-4 Jordan Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

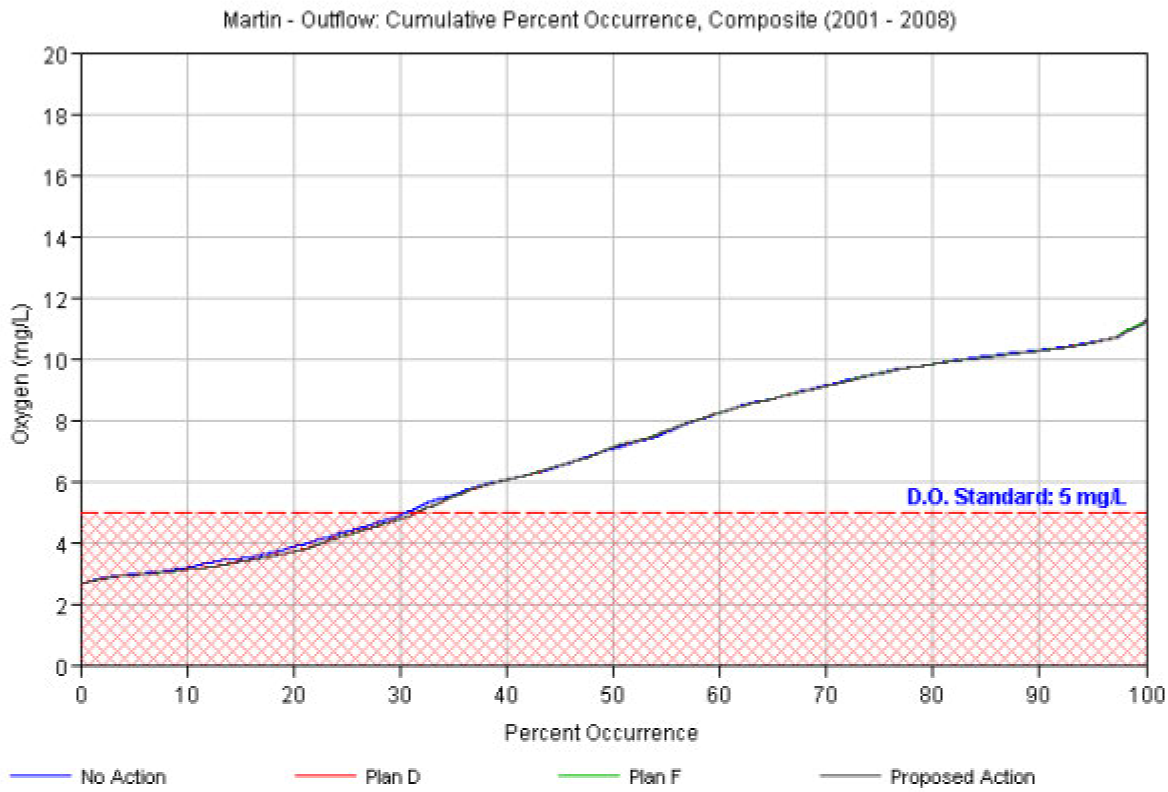


Figure 2.1-5 Martin Dam outflow dissolved oxygen for the modeled period (2000 – 2008).

The previous figures illustrate the lowest DO concentrations in dam tailraces throughout the basin. Low DO also occurs at Cartersville, Georgia (Figure 2.1-6). However, again a comparison of the No Action Alternative to various alternatives illustrates little change.

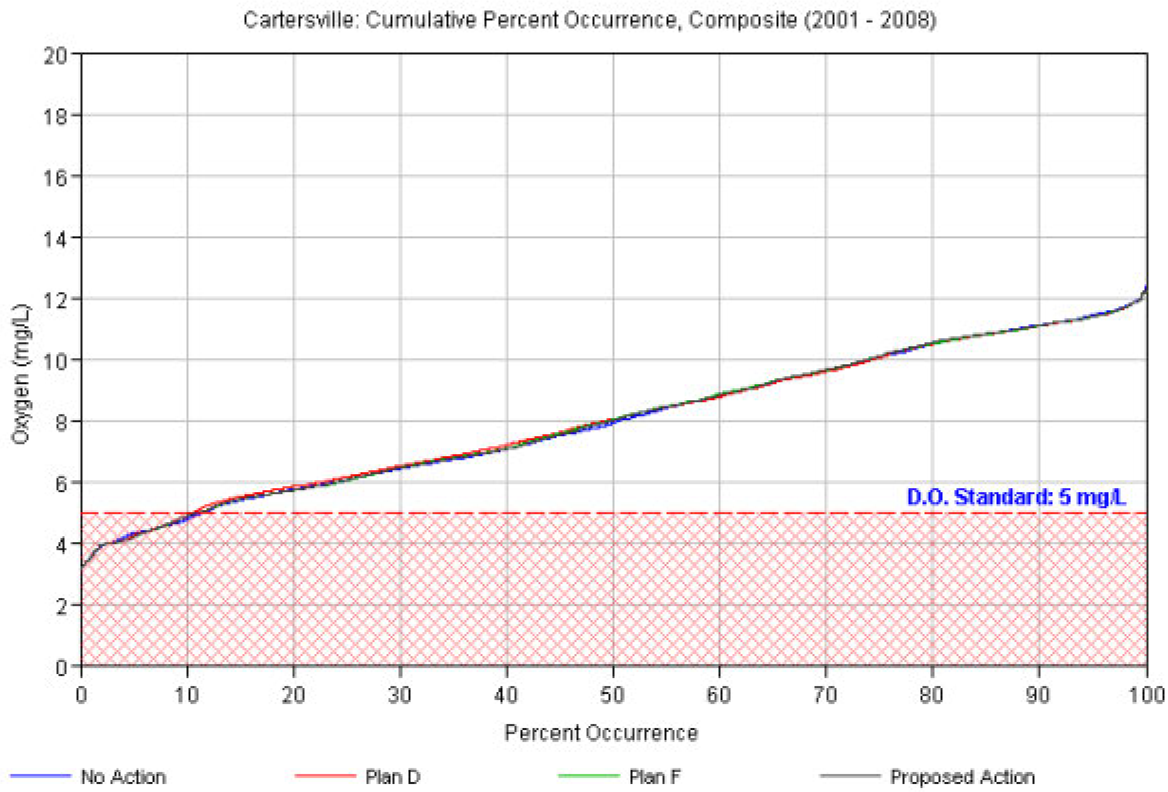


Figure 2.1-6 Cartersville, Georgia outflow dissolved oxygen for the modeled period (2000 – 2008).

The difference between the alternatives evaluated is the greatest downstream of Carters Lake (Figure 2.1-7) and at the confluence of the Coosa and Tallapoosa Rivers (between RM 300 and 350 on the Alabama River, Figure 2.1-8). Differences are the greatest during periods of dry weather conditions when drought operations are likely to be implemented. However, modeled differences from the No Action alternative are generally less than 0.5 mg/l.

Changes in releases from Carters Lake under the drought plan decrease DO downstream of the dam. DO recovers to concentrations near the No Action Alternative before Pine Chapel, 20 mi downstream (Figure 2.1-7).

In the Coosa River, changes in DO are also the greatest in a dry-weather year (Figure 2.1-9). In dry-weather periods, it would be expected that the Corps would operate for drought management. In much of the Coosa River, median DO concentrations during dry-weather periods would be expected near conditions similar to the No Action Alternative. However, DO downstream of Weiss Dam and Neely Henry Dam would be expected to be reduced during the growing season in dry-weather years. Downstream of Weiss Lake, median DO would be expected to decrease by nearly 1.0 mg/L. As illustrated in Figure 2.1-3, median DO over the modeled period is well above water quality standards at 8 mg/L. Median DO decreases by nearly 0.5 mg/L immediately downstream of Neely Henry Dam. Immediately downstream of other reservoirs (Jordan Dam and Lake, Mitchell Dam, and Logan Martin Dam), the median DO concentrations would be expected to increase by as much as 0.5 mg/L by the Plan D, Plan F, and the Proposed Action Alternative.

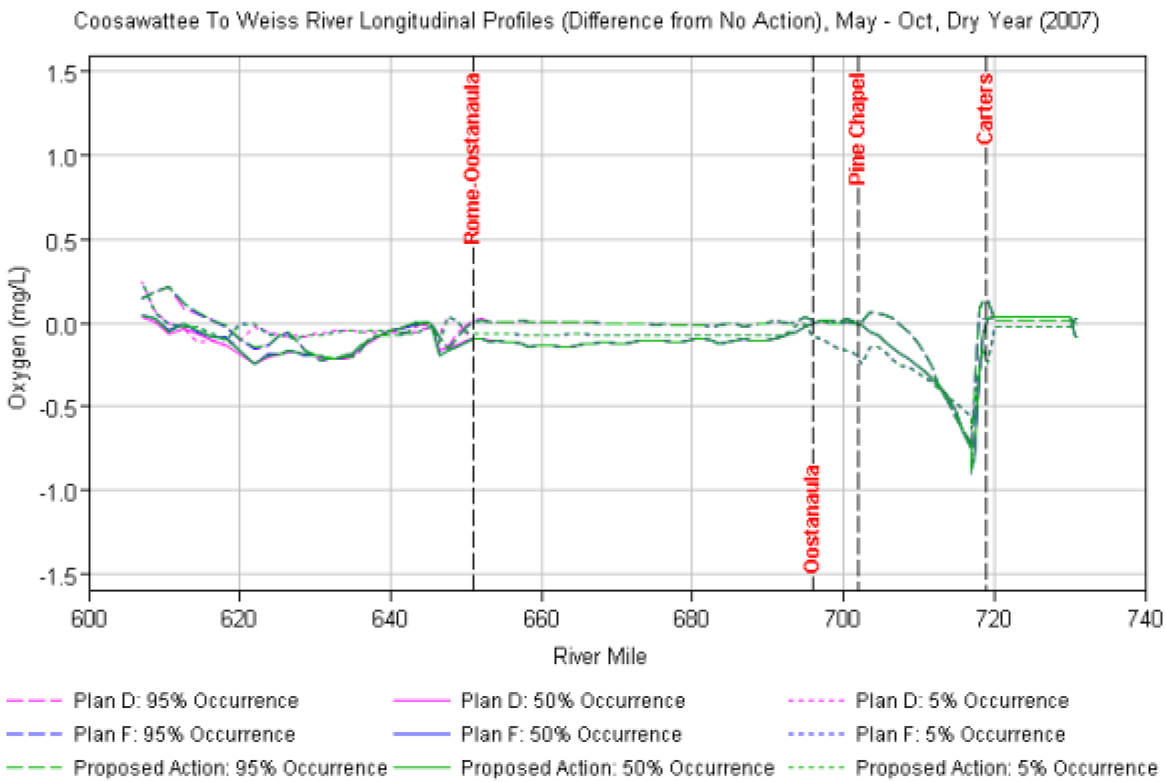


Figure 2.1-7 Oxygen longitudinal profile for May to October in a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

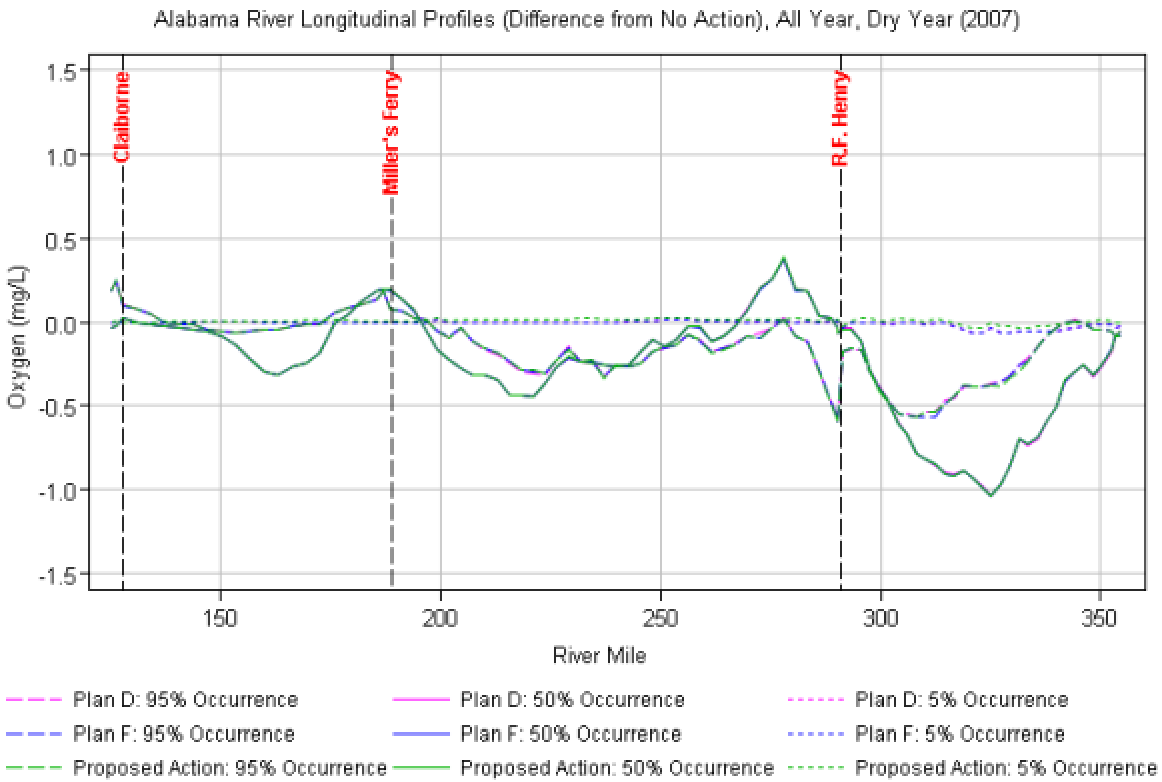


Figure 2.1-8 Alabama River oxygen longitudinal profile for a representative dry-weather year (2007).

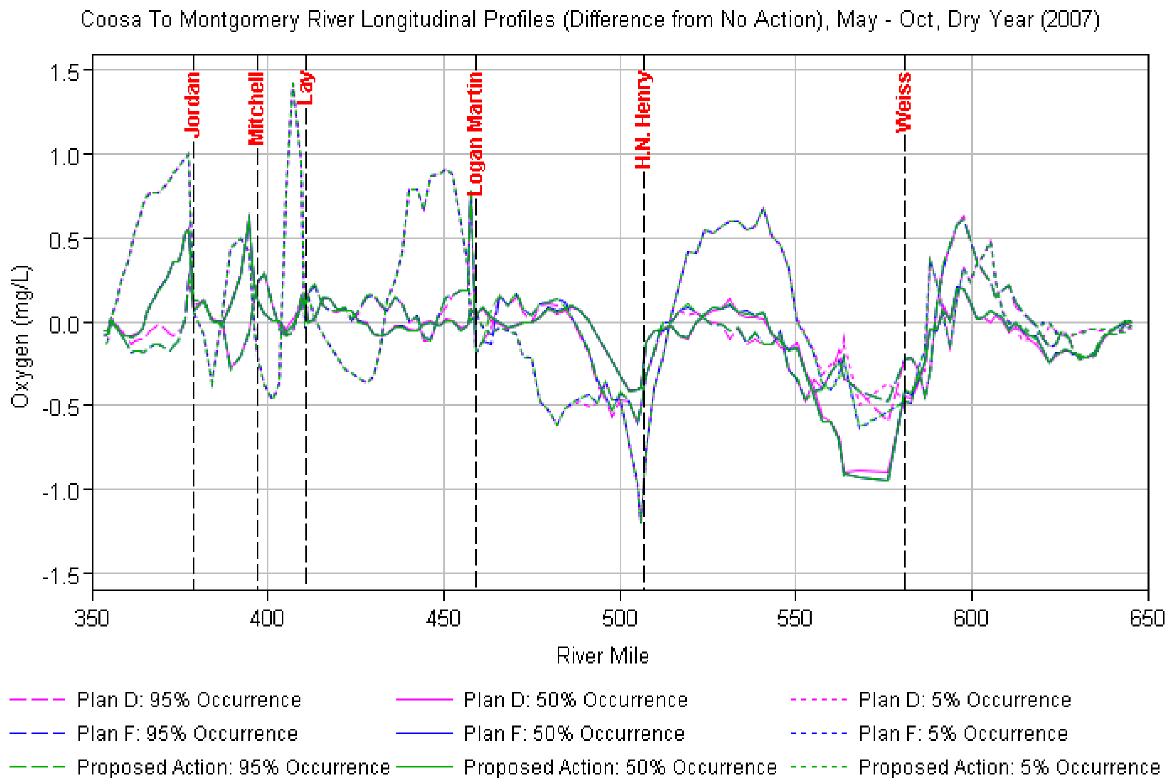


Figure 2.1-9 Coosa River oxygen longitudinal profile for May to October in a representative dry-weather year (2007).

In reservoirs with deep forebays, oxygen is often higher at the water surface and lower with depth through the water column. Reservoirs that release from deep water often release low oxygen water downstream. That is generally more pronounced in dry-weather years when inflows to reservoirs are low and retention times in reservoirs increase. That is illustrated by comparing Figures 2.1-7 and 2.1-10. The plots illustrate the Alabama River in a representative dry- and wet-weather year, respectively. The reason for the differences among alternatives is that each one uses different dam operations for drought management through a series of triggers. Those drought triggers change the way water is released during periods of drought in the ACT Basin.

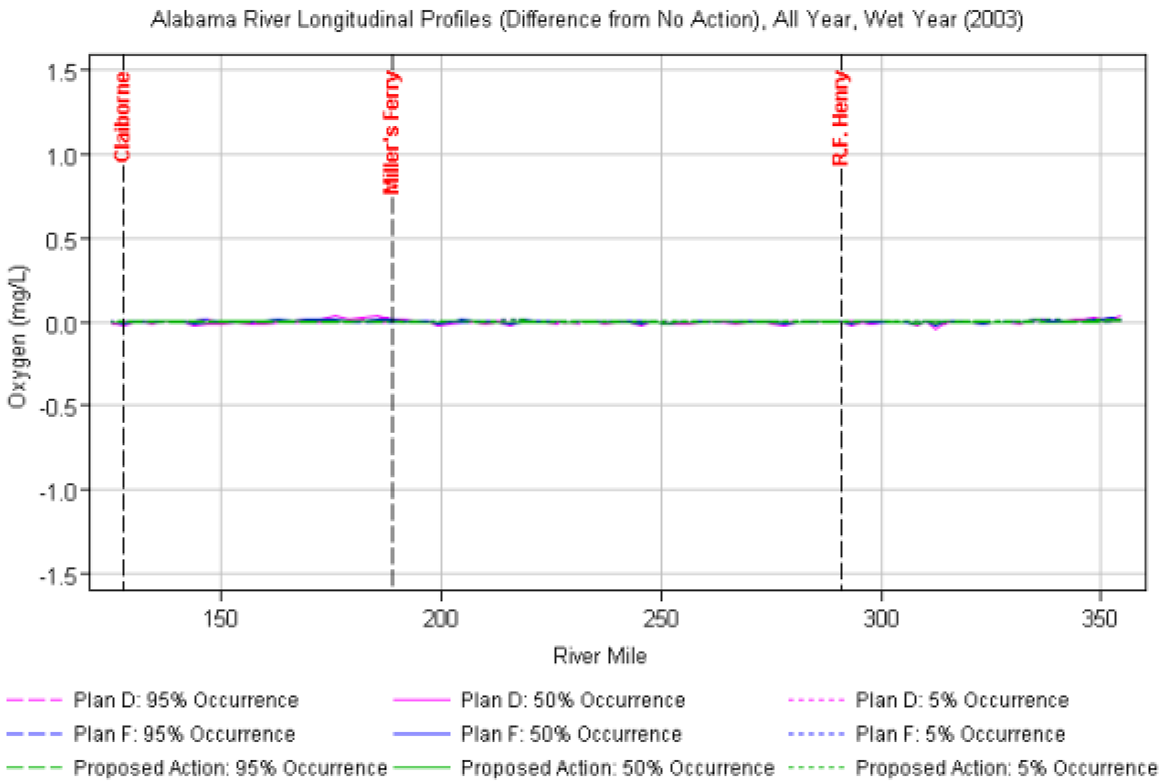


Figure 2.1-10 Alabama River oxygen longitudinal profile for a representative wet-weather year (2003).

Median DO downstream of Lake Allatoona in the Etowah River have little change for the No Action Alternative over the modeled period (Figure 2.1-11).

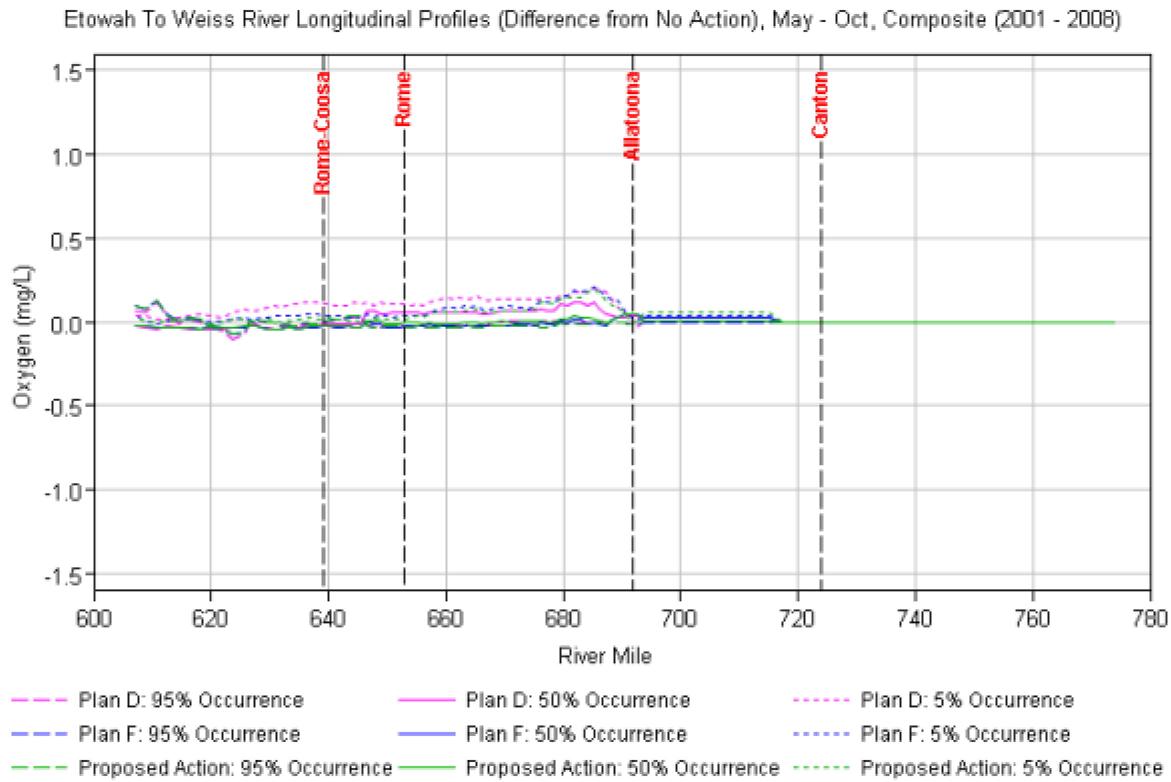


Figure 2.1-11 Etowah River oxygen longitudinal profile for May to October over the modeled period (2001 - 2008).

DO in the Tallapoosa River fluctuates immediately downstream of dams from May through October in a representative dry-weather year (Figure 2.1-12). Those fluctuations would be expected to occur at conditions near water quality standards; 4 mg/L downstream of dams.

In summary, our modeled evaluation of the impacts of the proposed action indicate that any declines in DO compared to the current operation of the Corps reservoirs would be isolated and usually less than 0.5 mg/l. Those declines would be most pronounced during extreme drought (5th percentile occurrence) and in some cases declines up to 1.0 mg/l could be seen. For the most part, the preceding graphs indicate that the proposed action would cause insignificant changes from the No Action alternative. In some cases the model indicates increases in DO up to about 1.0 mg/l. For Lake Allatoona releases, which the PAL identified as a specific concern, there would be little difference from current operations even in the extreme drought condition.

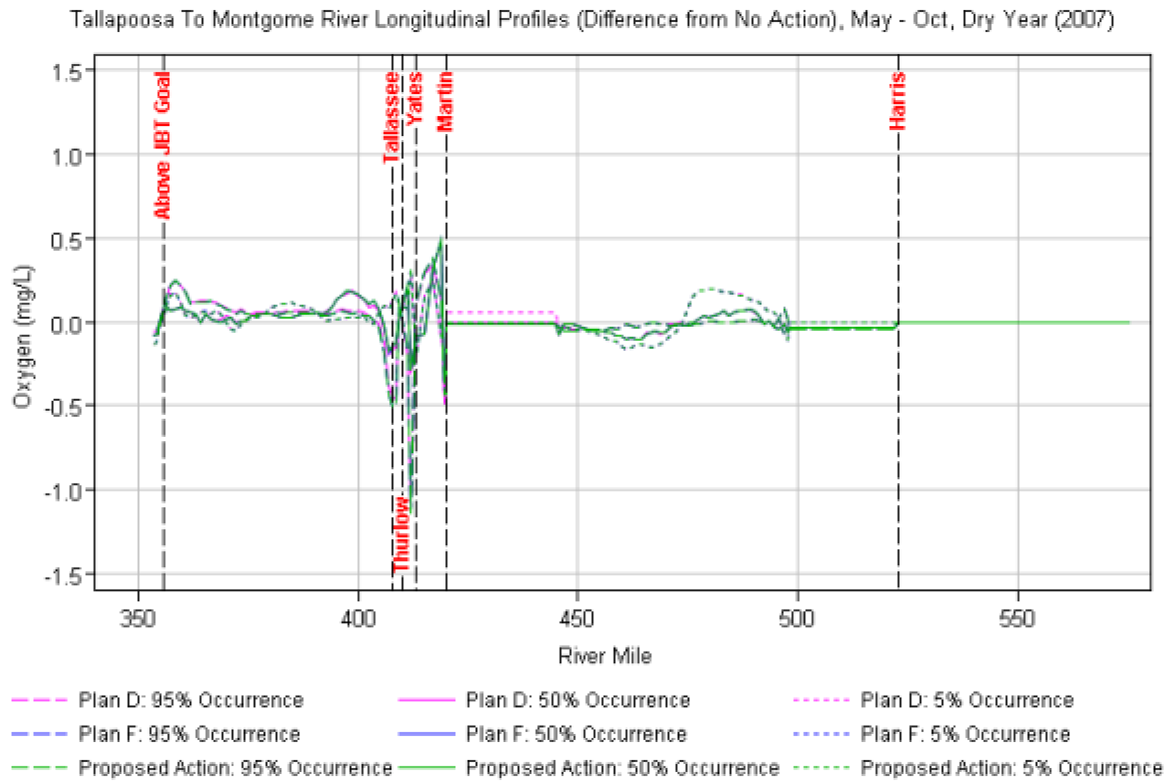


Figure 2.1-12 Tallapoosa River oxygen longitudinal profile for May to October in a representative dry-weather year (2007).

2.1.2 Total number of instantaneous "measurements" less than 4.0 mg/L

HEC5Q doesn't have the ability to simulate instantaneous DO. The river profile simulations suggest that DO values less than 4 mg/L are only expected at several tailrace locations (as illustrated in Figures 2.1-1 through 2.1-5).

2.1.3 Monthly exceedence figures and box plots with outliers for water temperature

Monthly exceedence figures for water temperature were not generated. The operational changes in the Proposed Action Alternative would be expected to affect water temperature along reaches of the ACT Basin where changes in DO were predicted. The largest fluctuations in water temperature were predicted at the confluence of the Coosa and Tallapoosa Rivers into the Alabama River. Along this reach the Proposed Action Alternative would be expected to increase median water temperatures by more than 1.8 °F (1°C) in a representative dry year (Figure 2.1-13).

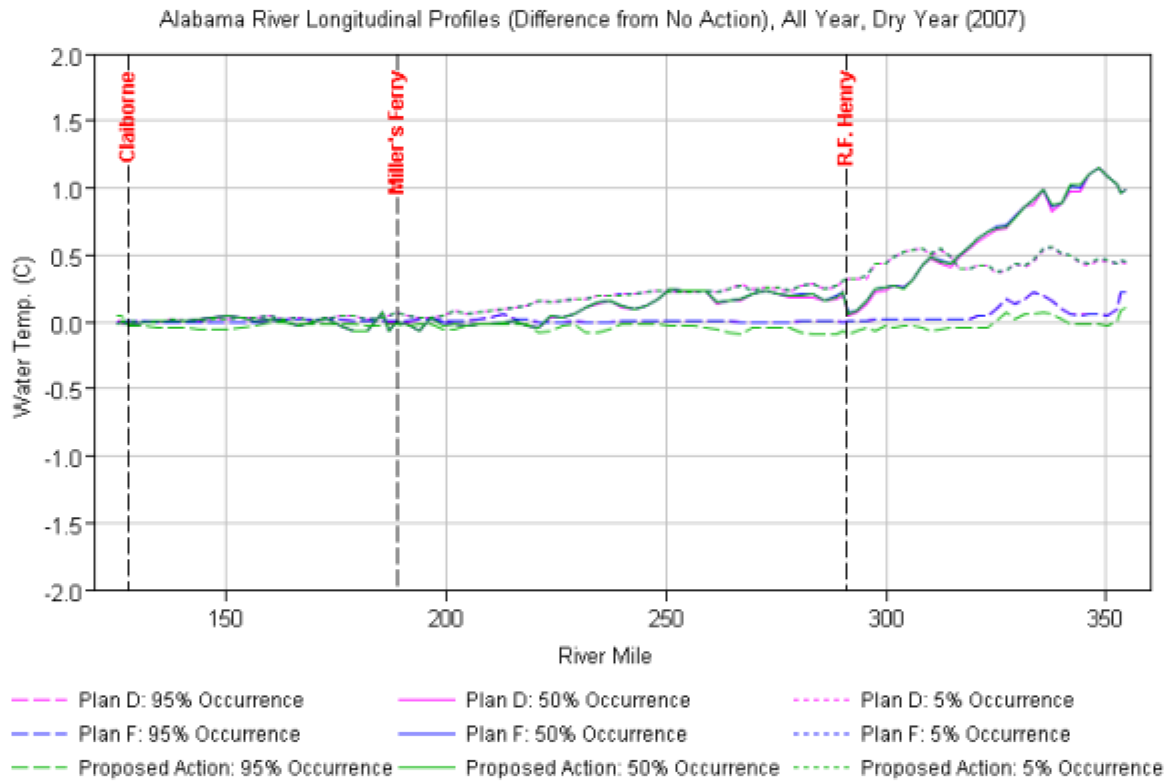


Figure 2.1-13 Alabama River longitudinal profile of water temperature in a representative dry-weather year (2007).

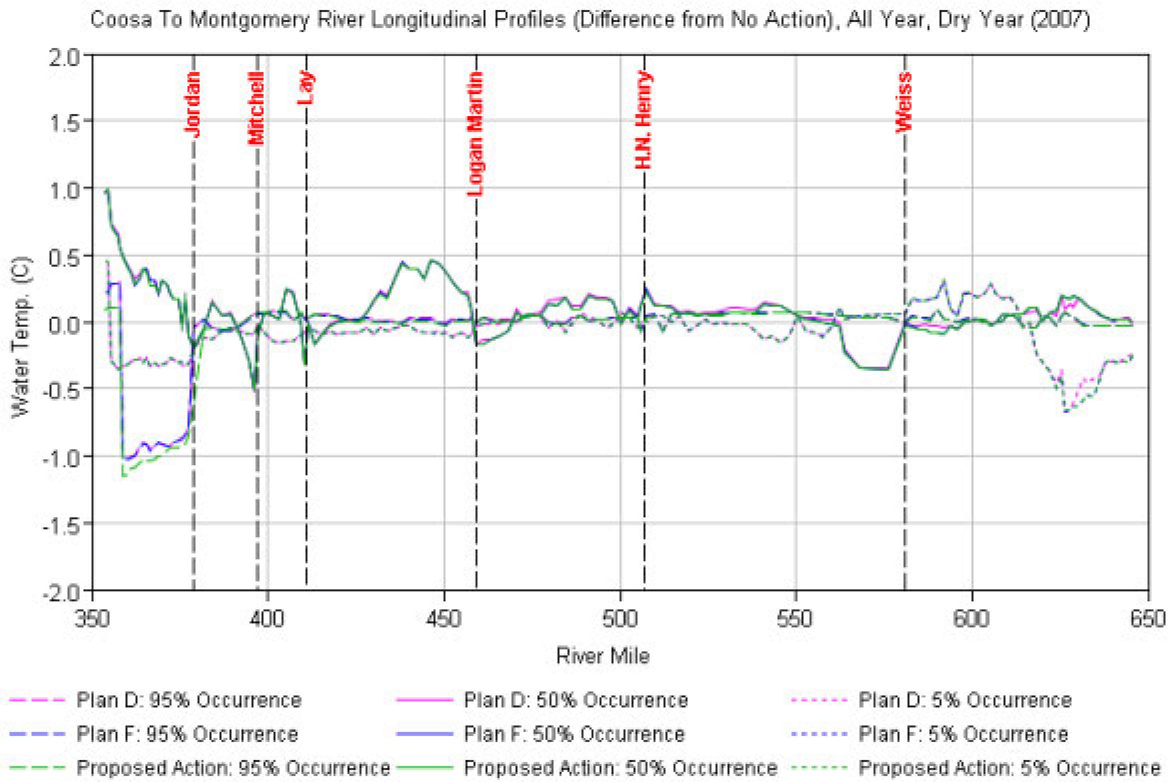


Figure 2.1-14 Coosa River water temperature longitudinal profile for a representative dry-weather year (2007).

The changes in modeled water temperature from the No Action Alternative have the greatest variation during periods when drought operations are likely to occur. However, the range of water temperatures predicted by the model as a change between various alternatives and the No Action Alternative would not be expected to be as great under observed conditions (Figure 2.1-14). APC operates Jordan Dam and Lake to ensure minimum flows (2,000 cfs) for protected species. The Corps HEC-ResSim modeled flows were less than what would actually be released during periods of drought. Therefore, as previously stated, water temperatures would not be expected to decrease as much as 1.8 °F (1 °C).

Little change in water temperature would be expected on the Alabama River over longer periods and when drought conditions have not triggered as seen in Figure 2.1-15. The Alabama River does not have reservoirs with storage but, instead, is dominated by reservoirs with run-of-river operations. Generally storage reservoirs have greater fluctuations in downstream water temperature.

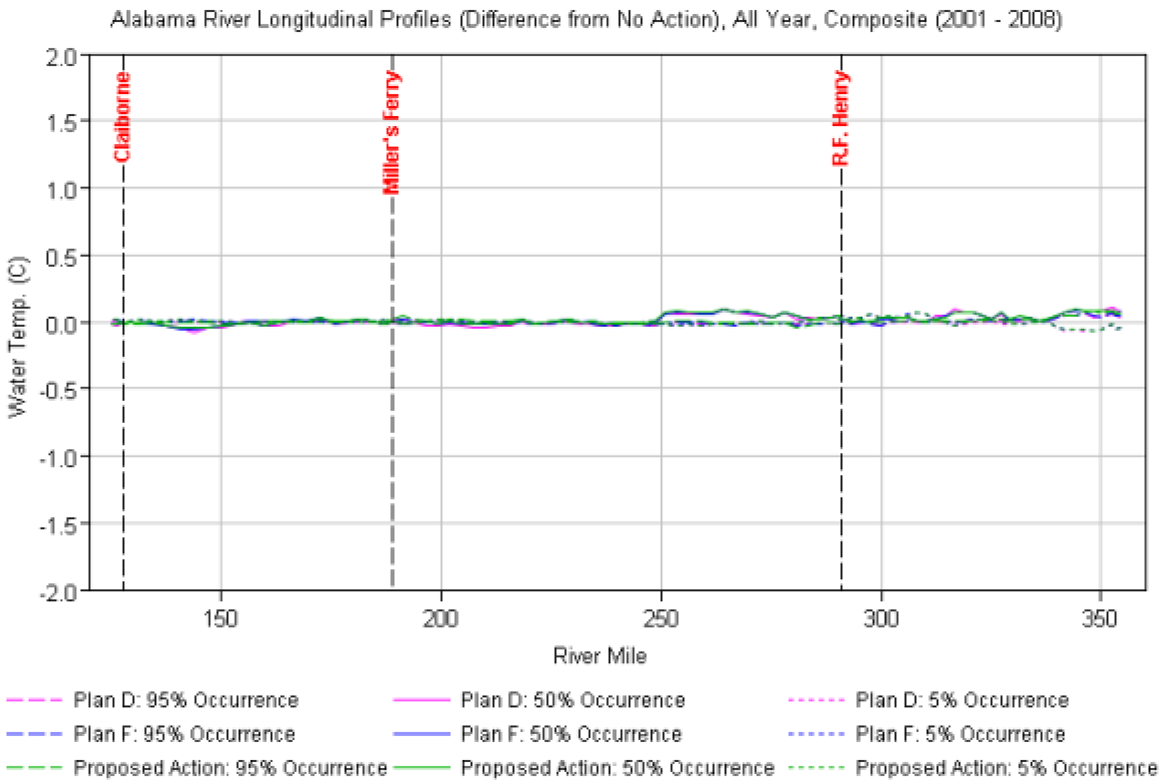


Figure 2.1-15 Alabama River water temperature longitudinal profile for the modeled period (2001–2008).

Water temperature fluctuations downstream of storage reservoirs would be expected directly downstream of Carters Lake. Water temperatures downstream of Carters Lake would be expected to decrease by around 0.7 °F (0.4 °C) and 1.5 °F (0.7 °C) as seen in Figures 2.1-16 and 2.1-17 respectively.

Median water temperatures downstream of the confluence of the Coosawattee and Oostanaula Rivers would be expected to increase by as much as 0.7 °F (0.4 °C) in dry-weather conditions (Figure 2.1-17). The health of aquatic species along the reach is a concern for stakeholders. Looking more closely at periods critical to aquatic species, when water temperatures are greatest, little to no change was modeled on the Oostanaula River (Figure 2.1-16). A decrease in water temperature downstream of Carters Lake during the growing season would likely benefit species. Changes in water temperature in the Coosawattee River would be expected to have negligible effects.

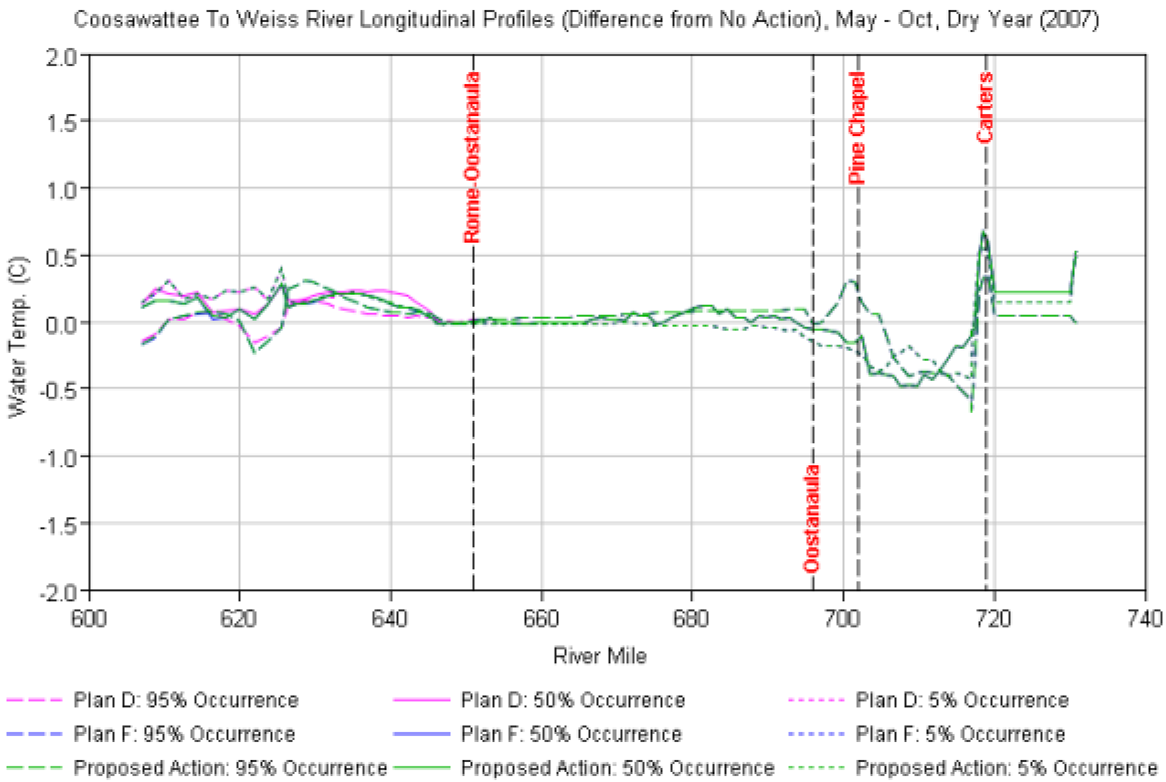


Figure 2.1-16 Water temperature longitudinal profile for a representative dry-weather year during the growing season from May through October (2007) from Carters Lake downstream to Weiss Lake.

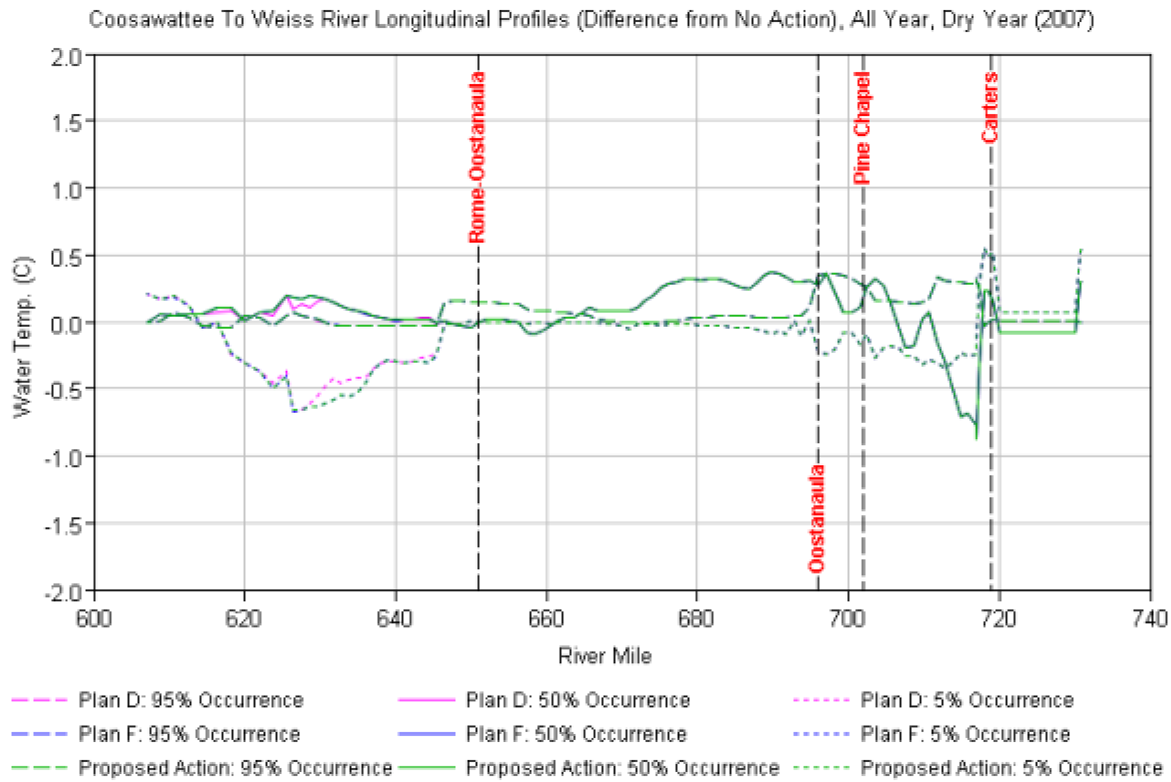


Figure 2.1-17 Water temperature longitudinal profile for a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

Similar to conditions downstream of Carters Lake, median water temperatures downstream of Lake Allatoona would be expected to decrease in dry years (Figure 2.1-18). A decrease in water temperature downstream of Lake Allatoona during the growing season in dry weather conditions would likely benefit aquatic species.

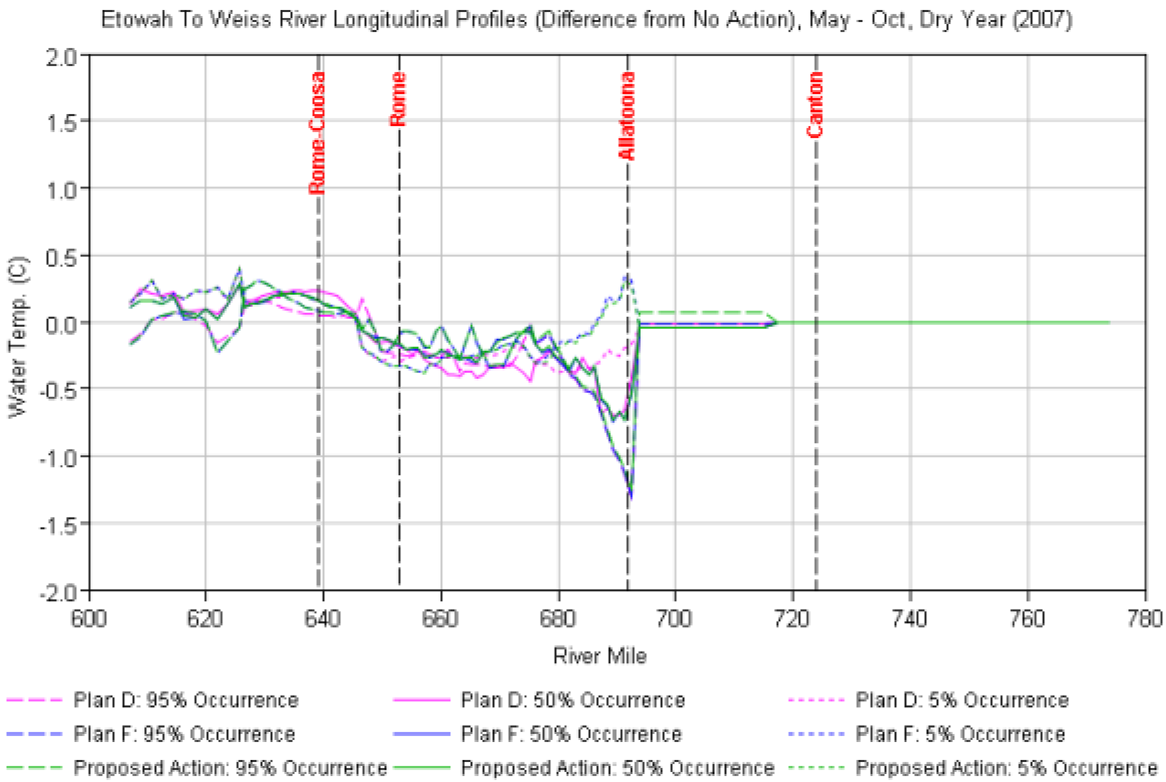


Figure 2.1-18 Etowah River water temperature longitudinal profile May through October for a representative dry-weather year (2007).

In the Tallapoosa River, over the modeled period, little change in water temperature would be expected (Figure 2.1-19). In reaches downstream of Lake Martin, water temperatures would be expected to decrease.

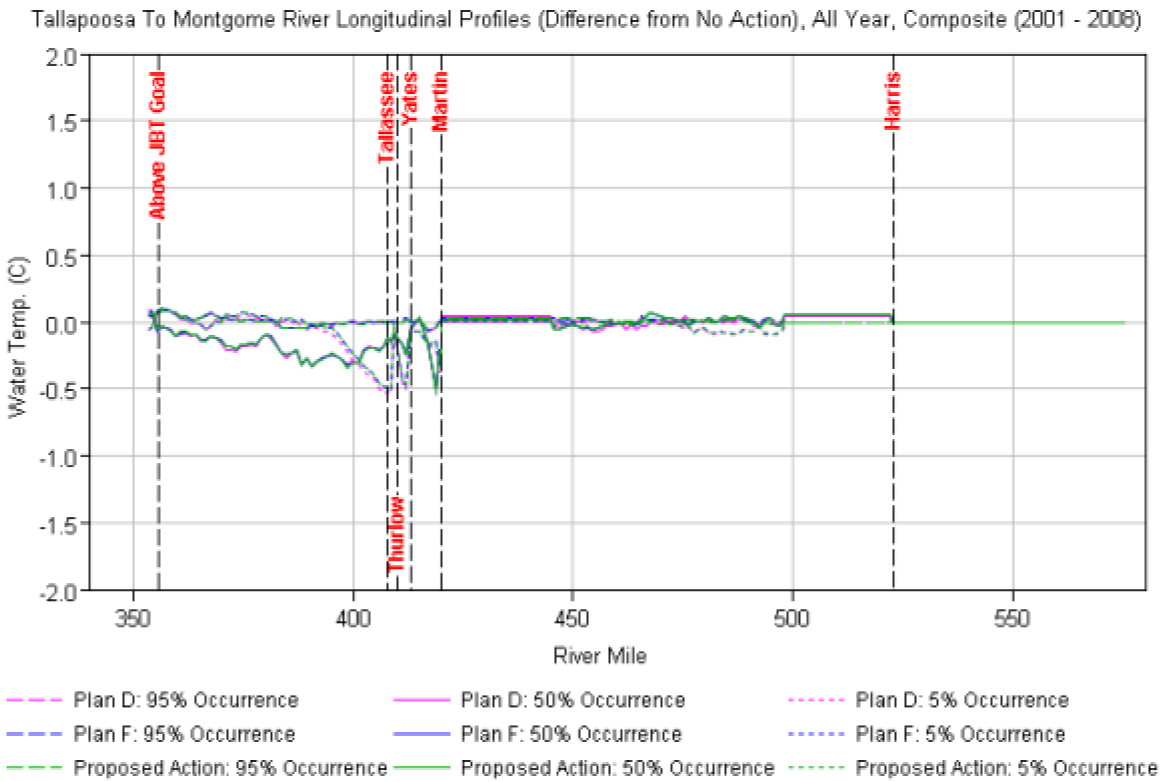


Figure 2.1-19 Tallapoosa River water temperature longitudinal profile for the modeled period (2001-2008).

2.1.4 Average stream percent wastewater

Figures 2.1-20 through 2.1-24 illustrate the percent of wastewater instream at various points in the ACT Basin for a period of low stream flow. From these plots it is clear that wastewater makes up less than 10 percent of the total flow in most cases. A ten mile reach downstream of Rome, Georgia and upstream of Weiss Lake may have a greater percentage of wastewater as illustrated in Figure 2.1-22.

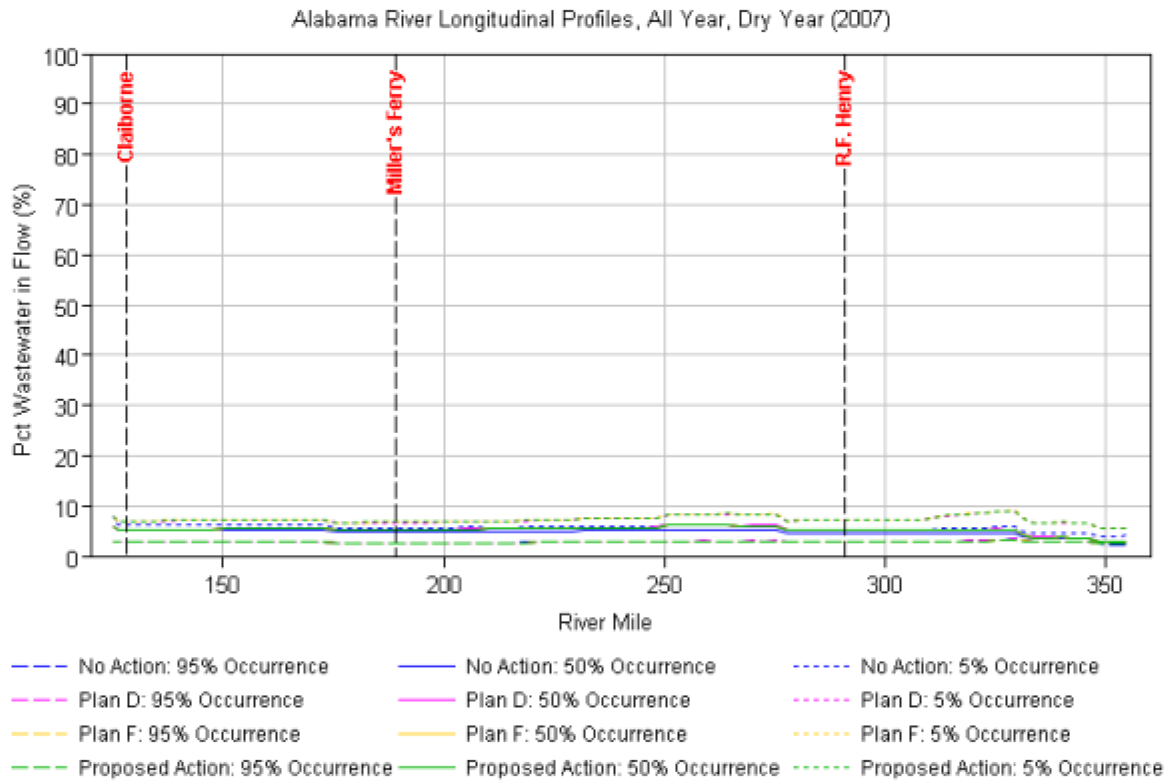


Figure 2.1-20 Alabama River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

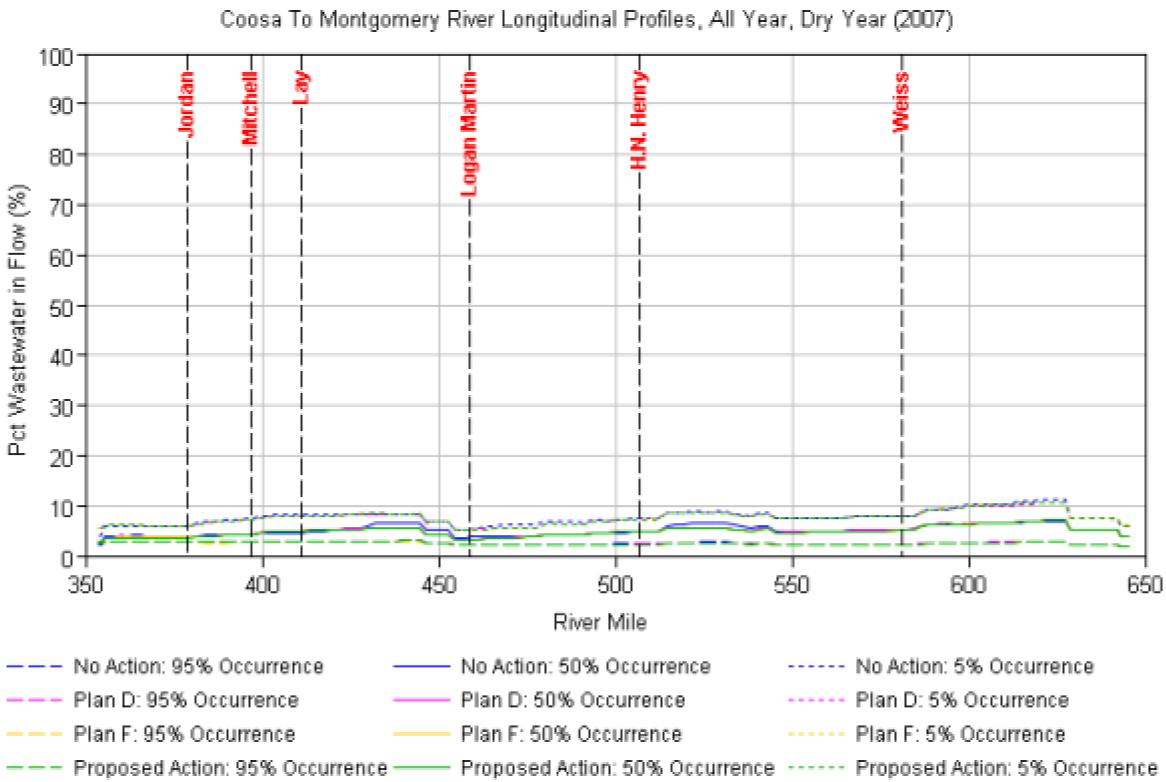


Figure 2.1-21 Coosa River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

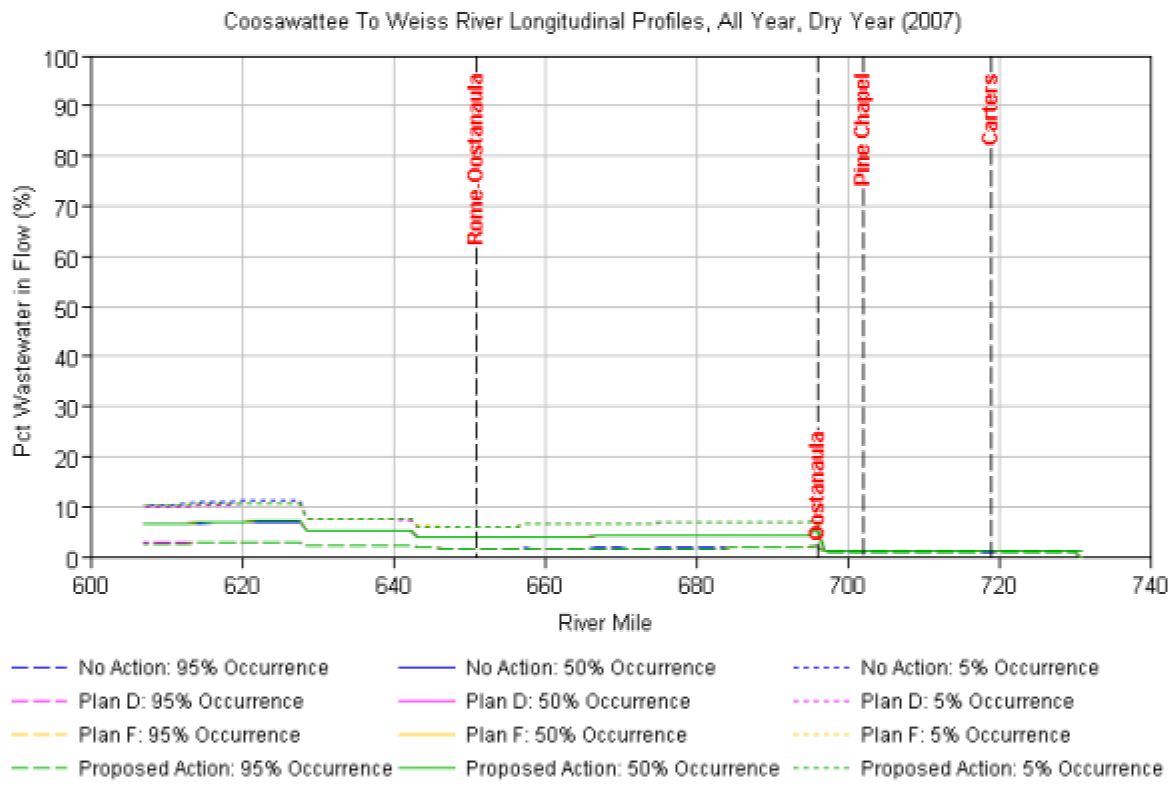


Figure 2.1-22 Coosa, Coosawattee, and Oostanaula rivers longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

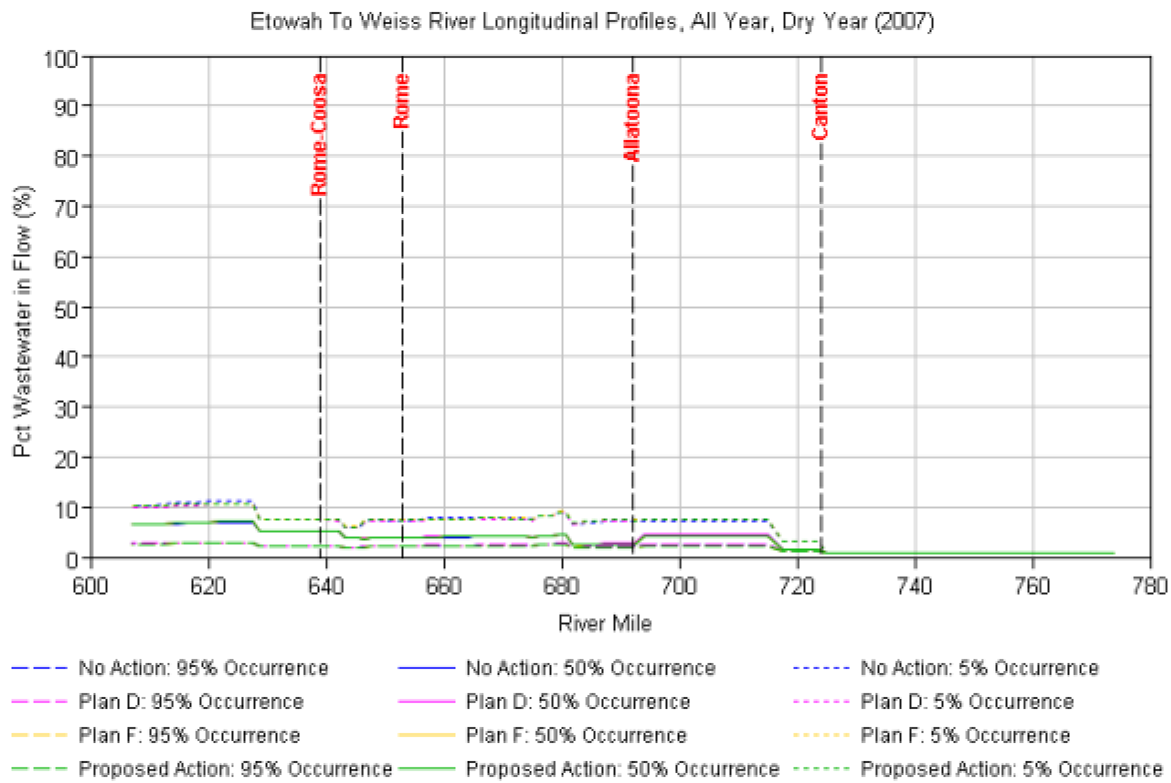


Figure 2.1-23 Etowah and Coosa rivers longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

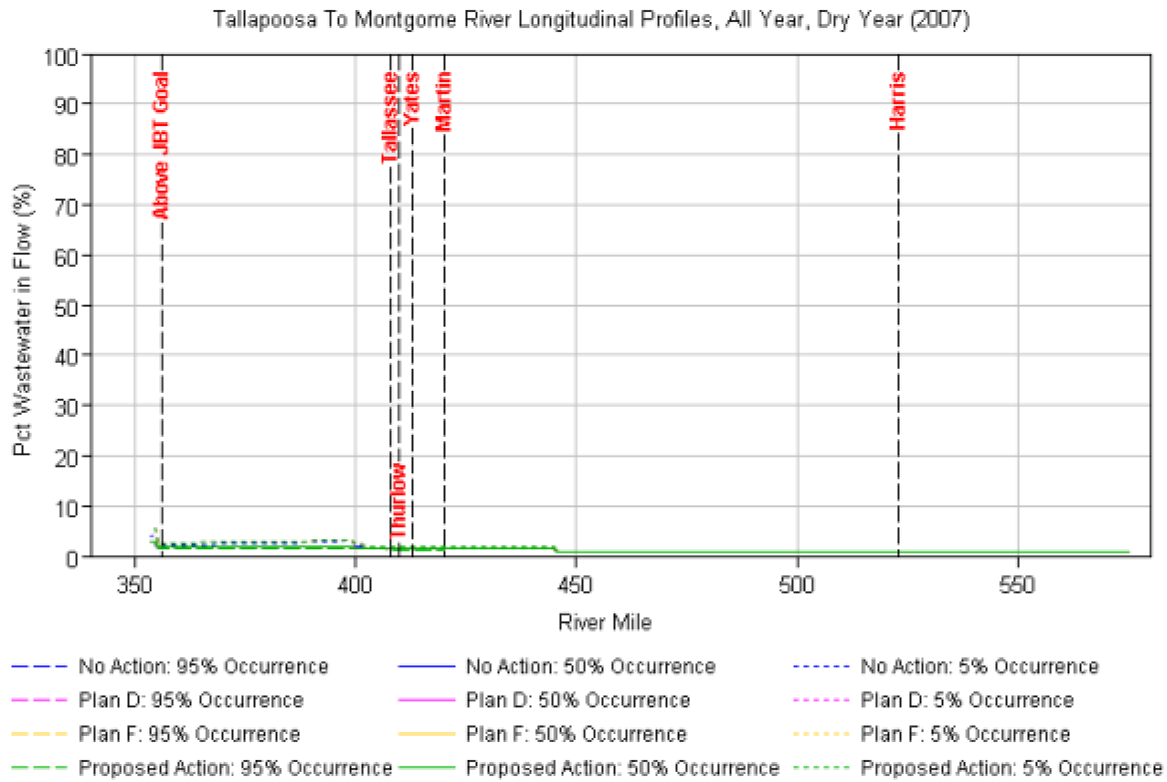


Figure 2.1-24 Tallapoosa River longitudinal profile of the percent of wastewater occurring in stream flow in 2007, a representative dry year.

2.2 Protection and enhancement of remaining free-flowing river habitats.

Identification and mapping of remaining free-flowing river habitats is generally beyond the scope of the current water control manual update. While the need is recognized, it is not a part of or affected by the Corps' effort to refine its operations to meet current conditions. The discussion that follows provides information that the Corps does have relevant to sediment transport, sedimentation, erosion and substrate characterization within our reservoirs.

The update of the ACT water control manual and plans focused on the operations of Corps reservoirs; therefore, it is most appropriate to focus on sediment transported by rivers rather than inputs from overland sources. However, comments are included where information was found that links land use change with an apparent effect on sediment loads. In general, the quantity and size of sediment transported by rivers is related to the size and frequency of dams in the river system. Impoundments behind dams serve as sediment traps where coarse bed material particles, typically sand and larger, settle in the lake headwaters where entering flows are slowed. Fine particles, typically silts and clays, can remain in suspension and pass through the lake downstream. Large impoundments typically trap most of the sediment load retaining all the sand and coarser particles plus much of the silt- and clay-sized particles. Smaller, run-of-the-river impoundments tend to pass all sizes of suspended particles during low to moderate flows and coarser bed material particles during high flows. The impact of the impoundments on river form is that the upstream channels can aggrade sediment and undergo an increase in bed elevation, thus reducing the channel gradient. Below a dam the river typically becomes starved for sediment. The channel downstream of a dam might or might not respond to the reduction in sediment load. The channel response depends on how resistant to erosion the channel bed and banks are and how quickly sediment is replenished from downstream tributaries and upland erosion sources. A typical response for channels, with bed and banks composed of easily eroded sands, silts, or soft clays, is for the bed to degrade to a reduced elevation; the channel might also widen through bank erosion.

The four largest impoundments in the system—Lake Martin, Lake Allatoona, Carters Lake, and R.L. Harris Lake—act as sediment traps, retaining most of the sand and larger bed material. Lake Martin accounts for 31 percent of the storage volume in the basin. Lake Allatoona is next largest, with 13 percent, followed by Carters Lake and R.L. Harris Lake, each with 8 percent. Shoaling in Lake Martin is not considered to be a problem because of the huge volume of storage available. A summary of the 2000 Lake Allatoona sedimentation study is included in Section 2.2.2.7.

2.2.1 Tailwater Degradation

Tailwater degradation is the lowering of the river bed elevation immediately downstream of a dam. Three factors drive the occurrence and rate of tailwater degradation: a ready supply of sediment from upstream, erodibility of the bed material, and sufficient flow energy to transport the bed material. After a dam's construction, a large portion of the sediment (as much as 90 percent for large reservoirs) often becomes trapped in the lake above the dam. Flow below the dam, having lost its sediment load to the lake, now has excess capacity to transport sediment. If the bed and bank materials below the dam are composed primarily of erodible sands, silts, and clays, tailwater degradation occurs until either the gradient of the river is sufficiently reduced to dissipate the flow energy, or the bed erodes to a more durable material such as bedrock. A cursory investigation of the tailwater degradation below the ACT projects was made using available data.

2.2.1.1 Claiborne Lake

On the ACT system, the most downstream dam is Claiborne. The tailwater reach extends approximately 72.5 mi downstream to the mouth of the Tombigbee River. Construction on the project began in May 1965 and was completed in September 1976. The slope of the river below the dam is approximately 0.06 ft/mi. The pool has little storage, and it is considered a run-of-the-river project.

Flow and gage measurements have been made below the dam since 1980. They were collected and analyzed to evaluate the degradation below the dam. The tailwater is tidally influenced, and there is a noticeable hysteresis effect in the tailwater rating curve. However, some trends are noticeable. The data were used, along with the rating curves applicable during the time of the measurements, to relate the observed gage heights and flows to a theoretical flow of 10,000 cfs (Figure 2.2-1).

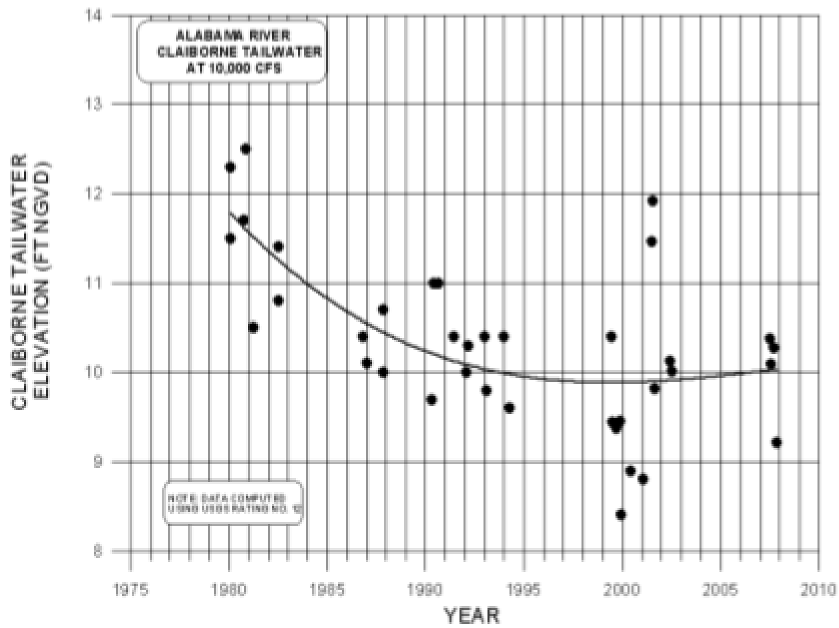


Figure 2.2-1 Claiborne Lake tailwater degradation.

A data gap exists between 1995 and 1999. In addition, the measurements after 2002 were all taken during extremely low flow and, thus, are less reliable because they are farther from the 10,000-cfs target. However, the data show a definite trend toward degradation from 1980 to 2000, perhaps caused by deepening and widening of the channel below the dam. From 2000 to 2007, the channel seems to be more stabilized. USGS has discontinued the rating curve at the site because of the variance in the gage caused by lockages, tides, and power generation at Millers Ferry Lock and Dam upstream.

2.2.1.2 Millers Ferry Lock and Dam and William "Bill" Dannelly Lake

Rating curve data are not available for Millers Ferry Lock and Dam tailwater.

2.2.1.3 Robert F. Henry Lock and Dam and R.E. "Bob" Woodruff Lake

Tailwater rating curve data are not available for Robert F. Henry Lock and Dam; however, historical sedimentation range surveys for the upper end of the Millers Ferry Lock and Dam pool (William "Bill" Dannelly Lake) were assessed for changes in the channel form. At range 30A, both widening and degradation have taken place since 1973 (Figure 2.2-2). However, the data show a drop in both widening and degradation rates since 1982. A trend plot of the sedimentation rates along the entire William "Bill" Dannelly Lake shows, for ranges 28A and 30A, bed degradation of about 0.5 ft per year from 1973 to 1982, and about 0.2 ft per year from 1980 to 1988 (Figure 2.2-3). For the next several ranges downstream from 28A, the bed has been at nearly a constant elevation. Data below range 20A indicate that the bed has been aggrading by several inches per year; thus, the scour is limited to the reach immediately below Robert F. Henry Lock and Dam.

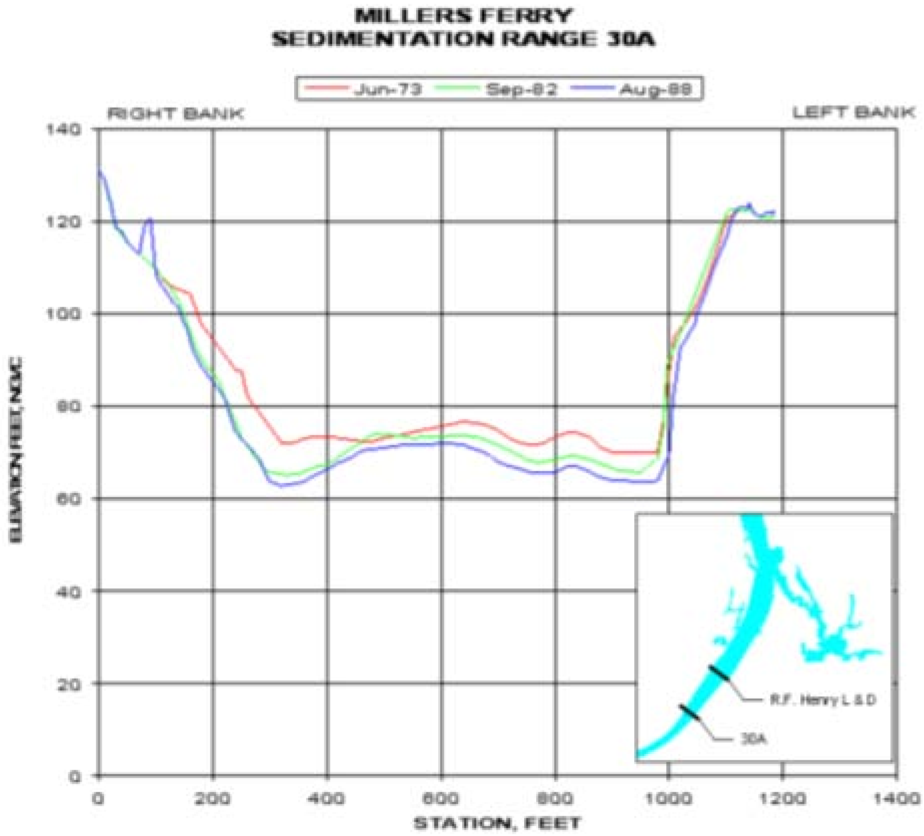


Figure 2.2-2 Tailwater degradation below Robert F. Henry Lock and Dam.

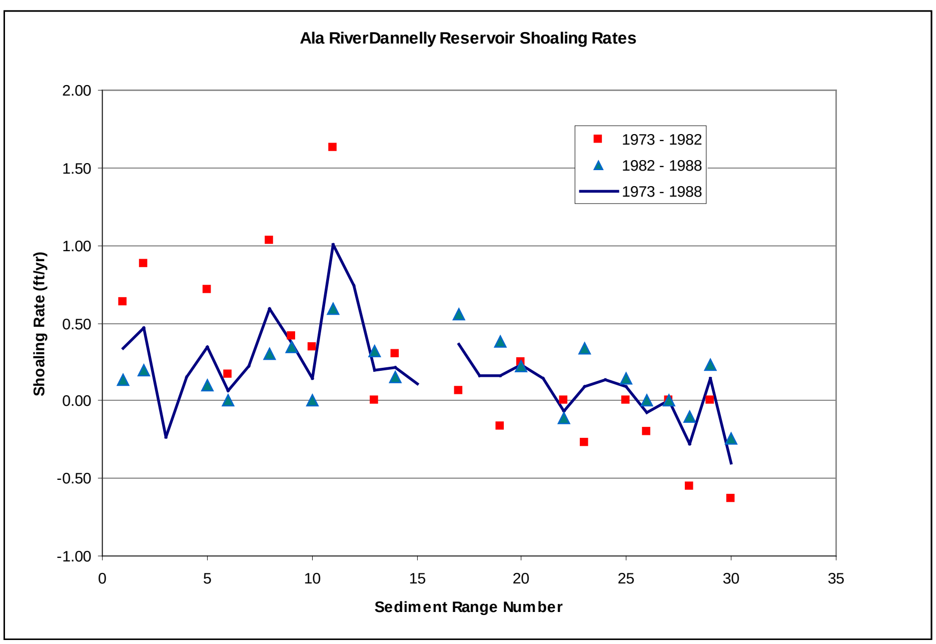


Figure 2.2-3 Shoaling rates for Millers Ferry Lock and Dam Pool, William "Bill" Dannelly Lake.

2.2.1.4 Logan Martin Lake

This APC dam was the second dam built as a part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1960, and operation began in 1964. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-4).

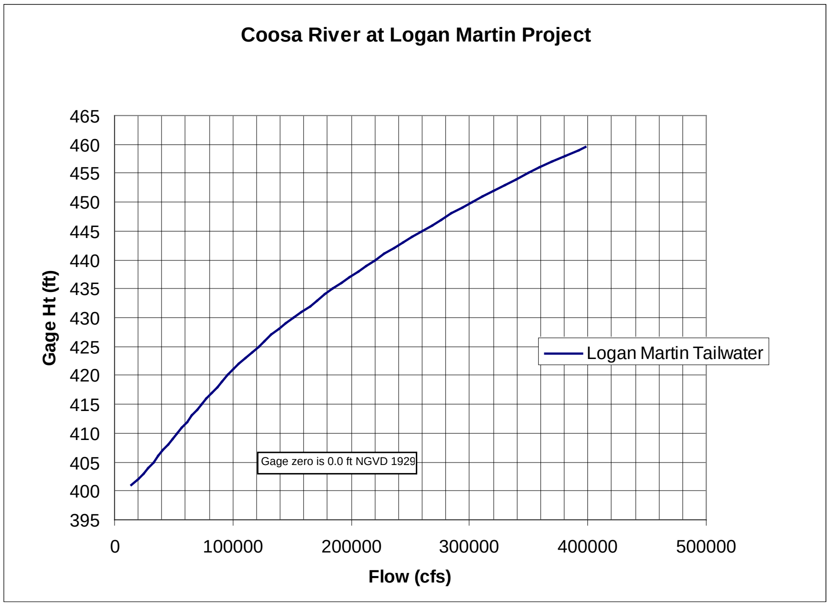


Figure 2.2-4 Logan Martin Lake tailwater rating curve.

2.2.1.5 H. Neely Henry Dam

This APC dam was part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1962, and operation began in 1966. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-5).

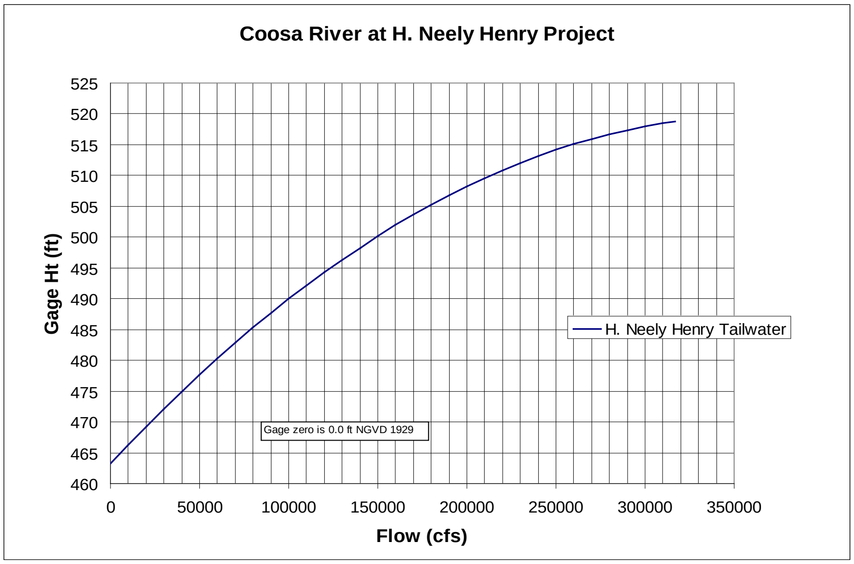


Figure 2.2-5 H. Neely Henry Dam tailwater rating curve.

2.2.1.6 Weiss Lake

This APC dam was part of an APC construction program that further developed the Coosa River in the late 1950s and the 1960s. Construction began in 1958, and operation began in 1961. There is a tailwater rating curve at both the power house and the spillway locations (Figure 2.2-6). No observable change has occurred in either of the tailwater rating curves developed for the project.

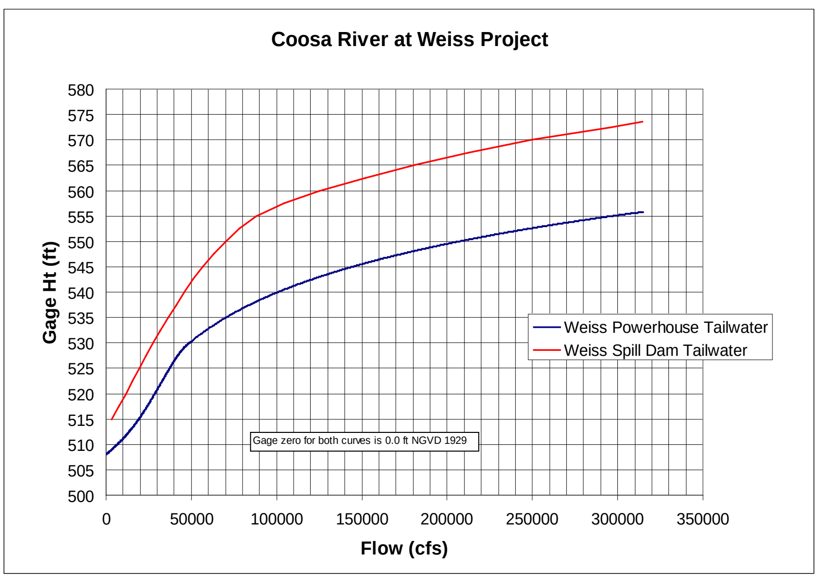


Figure 2.2-6 Weiss Lake tailwater rating curves.

2.2.1.7 R.L. Harris Lake

Construction began for this newest project on the Tallapoosa River in 1974, and operation began in 1983. No observable change has occurred in the tailwater rating curve developed for the project (Figure 2.2-7).

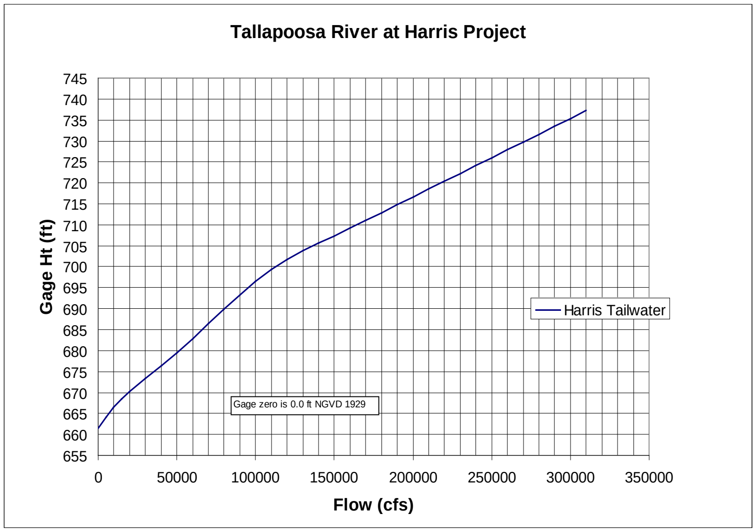


Figure 2.2-7 R.L. Harris Lake tailwater rating curve.

2.2.1.8 Carters Lake

Construction on Carters Lake was started in 1962 and completed in 1977. The USGS gage 0238500, (Coosawattee River at Carters) is at U.S. Hwy 411, just downstream of the Carters Reregulation Dam. Historic rating curve data extending from 1978 to 2008 at this gage were obtained from the USGS. The curves were plotted to determine the degree of movement in the curve over time (Figure 2.2-8).

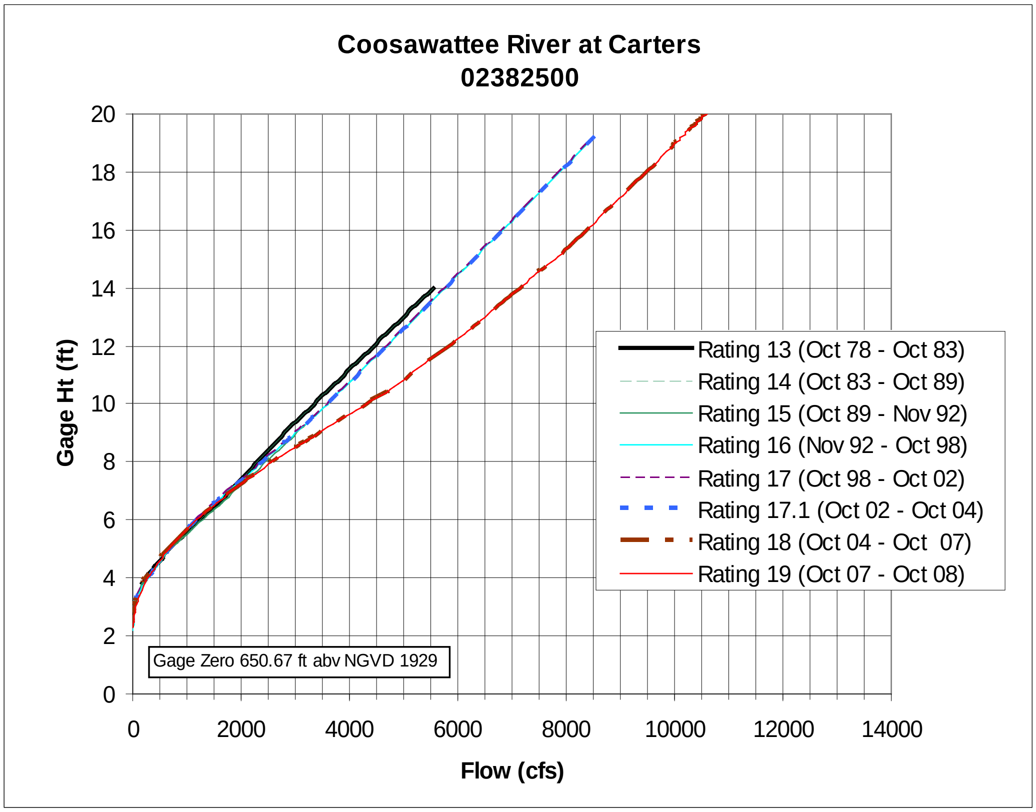


Figure 2.2-8 Carters Lake historic tailwater rating curves.

The curves show an obvious lowering of the tailwater of approximately 2–2.5 ft at flows above 3,000 cfs. However, the low flows do not appear to have been affected (Figure 2.2-9).

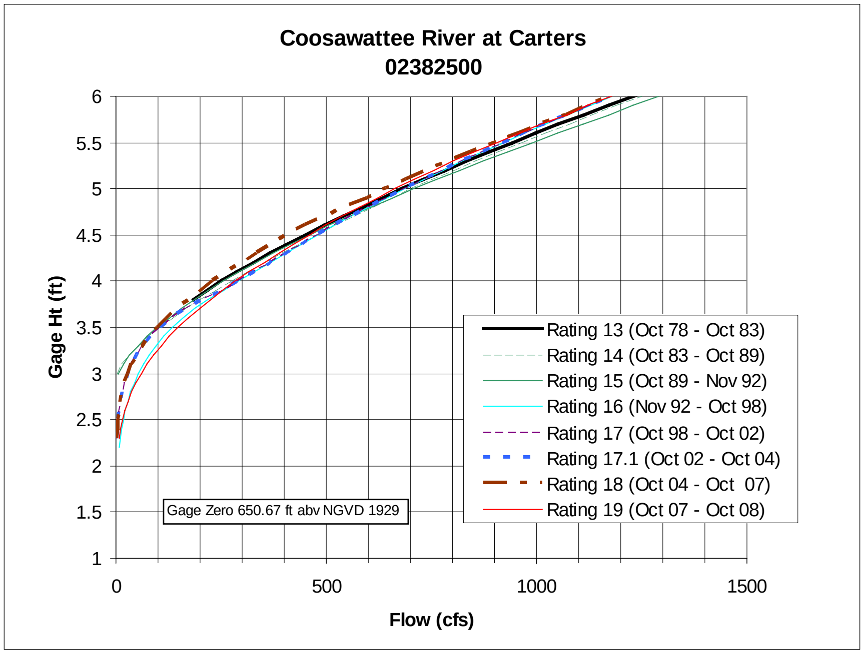


Figure 2.2-9 Carters Lake low-flow tailwater rating curves.

The lower part of the curve indicates that the channel has not degraded over time. The change in the upper part of the curve might have been because of the lack of high-flow data during the early years, and as more storms were observed, that part of the curve was well defined. Another possibility is that overbank clearing downstream might have occurred, or modifications to Hwy 411. The significant point is that the channel does not appear to have degraded. The presence of rock in the channel offers a reasonable and probable explanation for the lack of degradation.

2.2.1.9 Lake Allatoona

Construction on the dam was completed in 1950. The USGS gage 0239400, (Etowah River at Lake Allatoona, above Cartersville, Georgia) is 0.8 mi downstream from Lake Allatoona. Historic rating curve data extending from 1979 to 2008 at this gage were obtained from the USGS. The curves were plotted to determine the degree of movement in the curve over time (Figure 2.2-10). The curves show little difference over the period of record. The lower part of the curve shows no degradation over the 1979–2008 period, but degradation might have occurred during construction of the dam (Figure 2.2-11).

2.2.2 Impact of Existing Operations on River Channel Stability

A specific gage analysis was conducted at several USGS stream gaging stations in the basin to better understand the impact of dam operations on the stability of the rivers.

A cursory investigation of the condition of the pools was made to see if shoaling is a significant issue. Historic sediment ranges were evaluated where possible and other available data were used to estimate the appropriateness of using the existing area-capacity relationships in the modeling efforts.

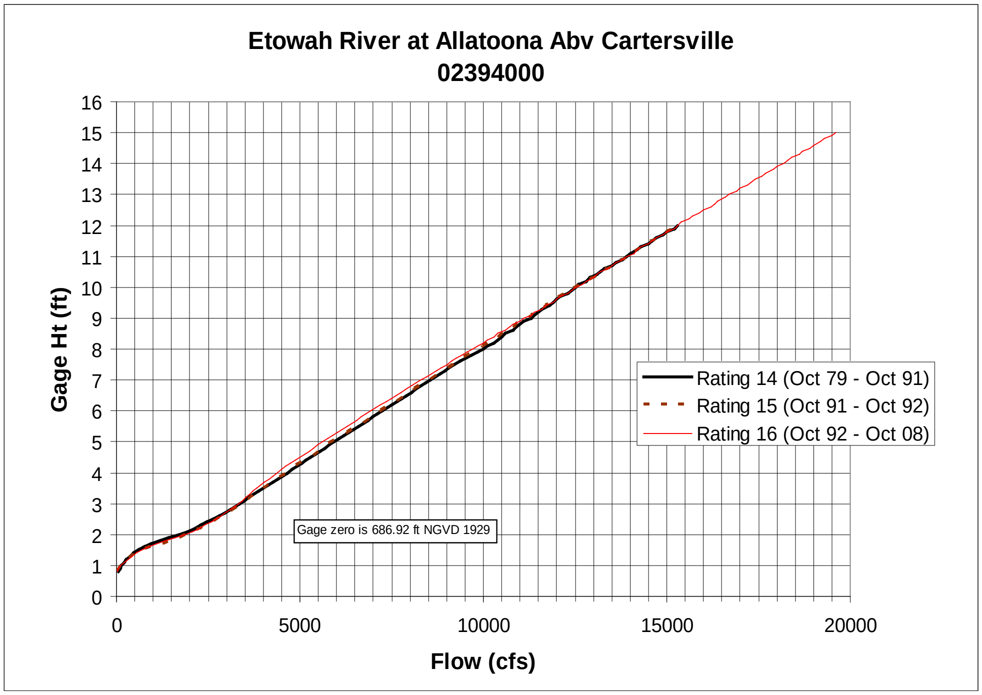


Figure 2.2-10 Lake Allatoona tailwater rating curve.

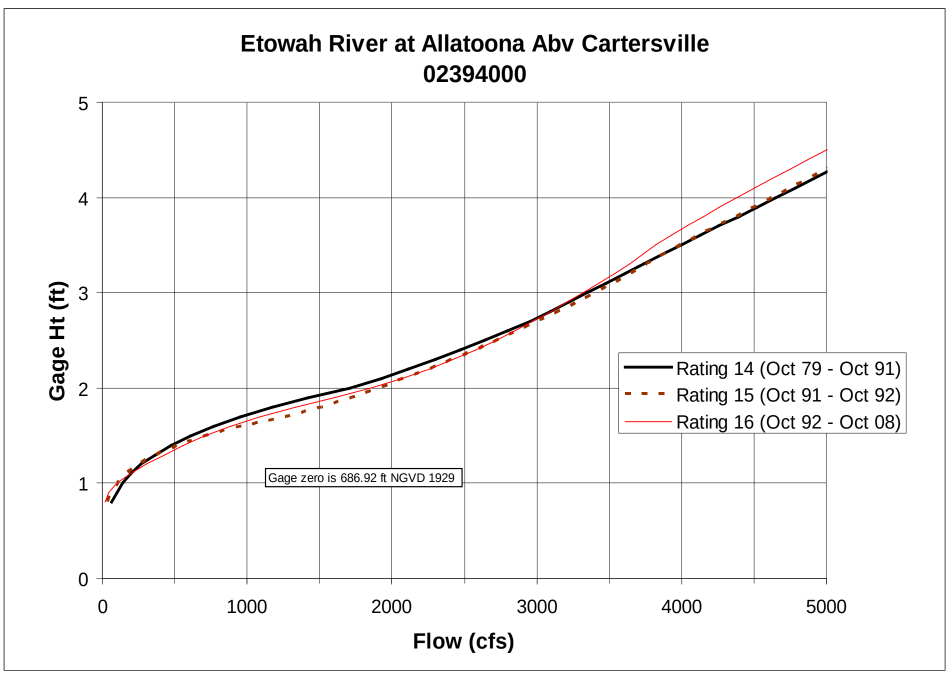


Figure 2.2-11 Lake Allatoona tailwater rating curve.

2.2.2.1 Claiborne Lake

Storage volume of the lake is listed at 96,360 ac-ft at elevation 35 ft. Sediment range surveys of the Claiborne Lake were made initially in 1982 and updated again in 2009. However, the pool has a relatively small amount of storage, and it is a run-of-the-river project. Operation of the project is not affected by the storage lost to shoaling in the lake, and it is reasonable to assume that the existing area/capacity curve is adequate to use in modeling the system and to include in the present WCM update.

A table of the shoaling locations and total dredging amounts since 1981 is shown below (Table 2.2-1). The data show that the location of the greatest dredging/shoaling is at the Millers Ferry Lock and Dam lower approach at RM 133, although the frequency of dredging is greatest at the Claiborne Lake upper approach, with consecutive periods between dredging events of 2, 6, 5, and 12 years since 1985.

2.2.2.2 Millers Ferry Lock and Dam and William "Bill" Dannelly Lake

Storage volume of the lake is listed at 346,250 ac-ft at elevation 80.8 ft. Surveys of the 30 sediment ranges in William "Bill" Dannelly Lake were made initially in 1973, 1982, and again in 1988 (Figure 2.2-12). The surveys were repeated in 2009.

The sections show some shoaling in the lower part of the reservoir between 1973 and 1982, at a reduced rate between 1982 and 1988. All 30 ranges were compared using approximate methods on the basis of the channel elevation change for the two periods. Data were not available for all the sections in the 1982 survey, but rates were computed for all the available data (Figure 2.2-12).

Table 2.2-1
Claiborne Lake dredging 1981–2007

Mile	Bar name	Period	Dredged	Cubic yards
72.5	Claiborne Lock	05/28/85–05/31/85	34+45 to 41+95	8,706
	Upper Approach	05/24/87–05/26/87	NA	12,044
		07/22/93–07/23/93	0+00 to 4+50	9,451*
		06/05/95–06/06/95	66+50 to 64+00	8,730*
		10/15/07–10/16/07	2+06 to 7+37	8,120
107.9	Wilcox (Bar 107)	10/07/92–10/10/92	22+00 to 36+40	24,313
		09/21/97–09/25/97	44+83 to 30+60	28,263
		10/19/07–10/20/07	32+17 to 43+78	4,237
117.5	Holly Ferry	10/05/92–10/07/92	5+00 to 15+00	15,977
122.7	Walnut Bluff	09/25/92–10/05/92	1+00 to 14+50	38,529
		10/20/07–10/23/07	3+28 to 14+28	25,076
133.0	Millers Ferry Lock and Dam	08/15/90–08/25/90	21+10 to 24+60	86,710
	Lower Approach		33+90 to 55+23	
		08/17/92–08/23/92	22+00 to 25+00	1,242
		10/23/07–10/23/07	54+00 to 55+59	735

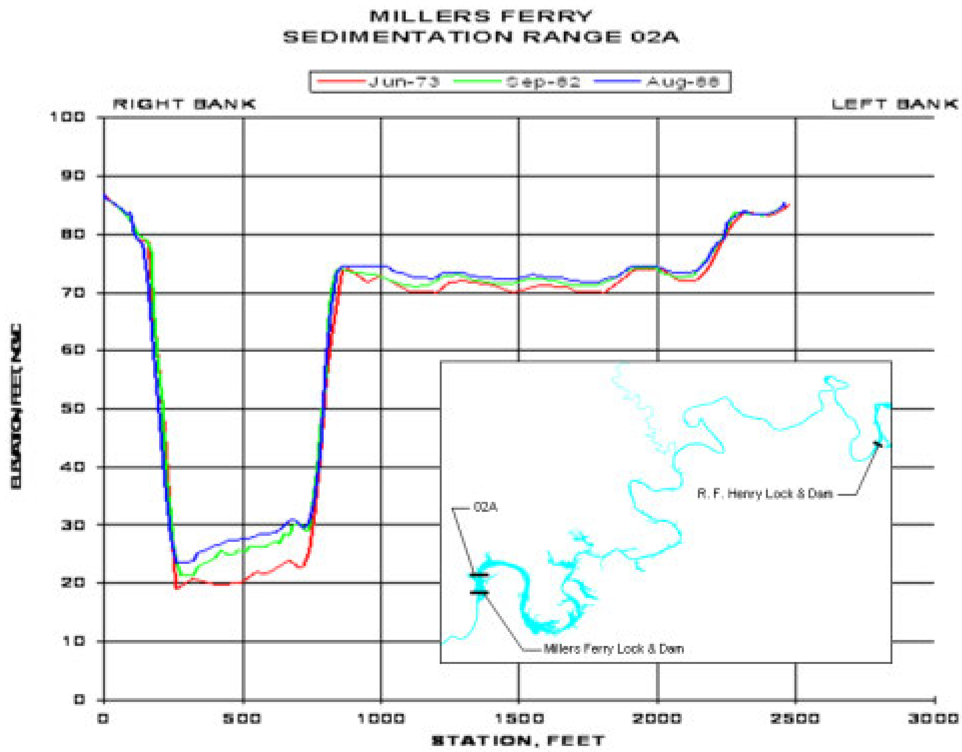


Figure 2.2-12 Cross section of Millers Ferry Lock and Dam Pool, William "Bill" Dannelly Lake, sedimentation range 02A.

For the 1973 to the 1982 period, shoaling and scour rate were the greatest, ranging from shoaling 1.6 ft/yr near Range 11, in the lower part of the lake to scouring 0.6 ft/yr at range 30 just below Robert F. Henry Lock and Dam. The 1982–1988 period shows that some shoaling occurred during that period over much of the lake with only minor scour in the upper lake reach. The overall trend from 1973 to 1988 indicates that, in general, scour has taken place immediately below Robert F. Henry Lock and Dam at range 30 downstream to about range 26. Sediment deposition has taken place from range 25 downstream to range 01, immediately above Millers Ferry Lock and Dam, at a rate of about 0.1 ft to 1.0 ft per year.

Geographic information system (GIS) data for the channel above Millers Ferry Lock and Dam were obtained in February 2009. The data can be used to develop a new area/capacity curve but would require additional hydrographic surveys to extend the limits to the top of banks. An update of the area/capacity curve would be helpful, but using the present curve for the present modeling effort is not unreasonable.

2.2.2.3 Robert F. Henry Lock and Dam and R.E. "Bob" Woodruff Lake

Storage volume of the lake is listed at 234,200 ac-ft at elevation 125 ft. Surveys of the R.E. "Bob" Woodruff Lake were made initially in 1974. The surveys were repeated in 1982 and 1988. They were re-surveyed again in 2009. Throughout the entire pool from 1974 to 1988, minor amounts of both shoaling and bank erosion occurred with the highest rates occurring between 1974 and 1982. The shoaling and bank erosion shown in Figure 2.2-13 is representative for all the sedimentation ranges in the pool.

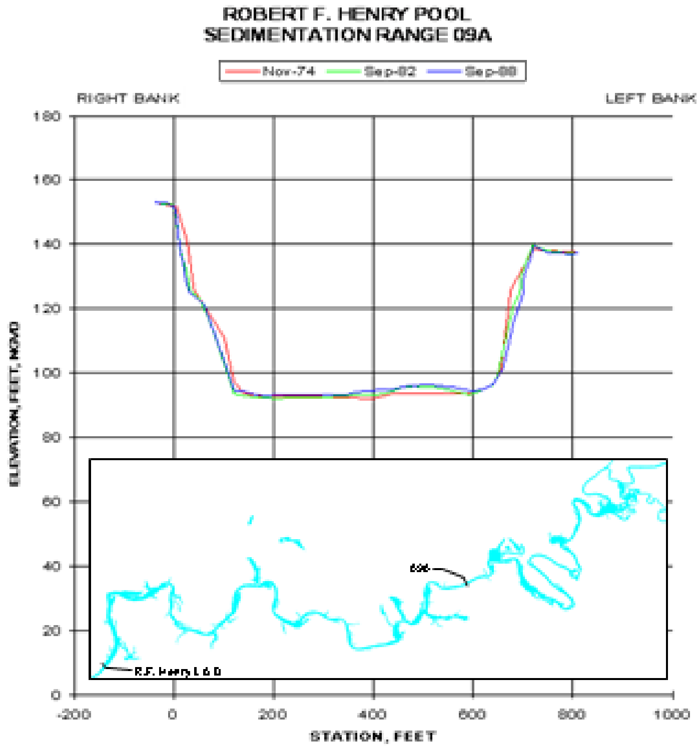


Figure 2.2-13 Cross section of Robert F. Henry Lock and Dam and R.E. "Bob" Woodruff Lake, sedimentation range 09A.

The sedimentation range surveys indicate that the overall change in storage is small, thus operation of the project would not be affected by the shoaling shown in the lake, and it is reasonable to assume that the existing area/capacity curve is adequate to use in modeling of the system and to include in the present WCM update.

2.2.2.4 Logan Martin Lake

Logan Martin Lake is in the Alabama counties of Calhoun, St. Clair, and Talladega. The lake has a surface area of 15,263 ac and 275 mi of shoreline at a normal pool elevation of 465 ft. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the National Agricultural Statistics Service (NASS) Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the percent change in erosion from 1970 to 2001 was derived (Table 2.2-2). The impact of the erosion on the Area/Capacity relationship has not been determined.

Table 2.2-2
Erosion 1970–1982 for counties in the ACT Basin

County	Year	Acres cultivated	% Change	Erosion rate	Tons soil eroded	% Change
Calhoun	1970	14,210		7.2	102,312	
	2001	5,518	–61.2%	6.0	33,108	–67.6%
Cherokee	1970	40,080		7.2	288,576	
	2001	32,518	–18.9%	6.0	195,108	–32.4%
Etowah	1970	20,200		7.2	145,440	
	2001	6,018	–70.2%	6.0	36,108	–75.2%
St. Clair	1970	4,810		7.2	34,632	
	2001	18	–99.6%	6.0	108	–99.7%
Talladega	1970	28,250		7.2	203,400	
	2001	18,318	–35.2%	6.0	109,908	–45.96%

2.2.2.5 H. Neely Henry Lake

H. Neely Henry Lake is in the Alabama counties of Calhoun, Cherokee, Etowah, and St. Clair. H. Neely Henry Lake has a surface area of 11,235 ac and 339 mi of shoreline at a normal pool elevation of 508 ft. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the NASS Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the changes shown in Table 2.2-2, for H. Neely Henry Lake are applicable.

2.2.2.6 Weiss Lake

Weiss Lake is in Cherokee County, Alabama (population 23,988, year 2000) and Floyd County, Georgia (population 90,565, year 2000). The surface area of the reservoir at a normal pool elevation of 564 ft is approximately 30,200 ac with approximately 447 mi of shoreline. Siltation studies by APC have been limited to evaluating the recreational impact of siltation at the mouths of tributaries. Studies indicate that shoaling over the years is reduced because of increased vegetation in the basin. Erosion studies indicate that sheet and rill erosion on cropland for 1982 was approximately 7.2 tons/ac/yr in Alabama. Sheet and rill erosion on cropland for 1997 was approximately 6.0 tons/ac/yr in Alabama. Cropland acreages were obtained from the NASS Web site for the years 1970 and 2001. Assuming no improvement in erosion control (worst case) from 1970 to 1982 and no improvement from 1997 to 2001, the changes shown in Table 2.2-2, for Weiss Lake are applicable.

2.2.2.7 Lake Allatoona

A cursory screening of the need for additional sedimentation range surveys to re-compute the area-capacity curve and of the shoaling tendencies of Lake Allatoona was made in the year 2000 (USACE, Mobile District 2000). That study was deemed adequate to determine the need for further re-survey of sediment ranges or reestablishing the area/capacity curve.

Analysis of the data revealed that sedimentation and scour had occurred in varying amounts throughout the lake. Overall, the analysis revealed consistently light or no sedimentation in the main body of the lake. Most of the high sedimentation occurred in the outermost reaches of the lake. The reaches are primarily high-inflow locations such as stormwater system outlets and at the mouths of tributary streams. As a result, increased sedimentation is most likely occurring on two levels: (1) sediment loads being carried into the lake with the tributary and outlet flows, and (2) increased flow velocities in those areas are actually eroding the channels and depositing the resulting sediment further downstream.

The level of increased sedimentation in the outermost reaches is not surprising because the area surrounding the lake has experienced dramatic development in recent years. Much of the development can be seen in Cobb County, especially along the I-75 corridor, and in Cherokee County between I-75 and I-575. The region has matured into a major part of suburban Atlanta, bringing with it extensive residential and commercial infrastructure.

The study indicates that the shoreline of Lake Allatoona seems to have experienced relatively little sedimentation or scour in the years since its construction. The shoreline appears to be consistent throughout each of the survey data set.

On the basis of the year 2000 study, it is reasonable to assume that the existing area/capacity curve is adequate for ResSim modeling and for continued use in the Lake Allatoona WCM.

2.2.2.8 Carters Lake

Storage volume of Carters Lake is listed at 242,200 ac-ft for inactive storage, 134,900 ac-ft for power storage, and 95,700 ac-ft for flood storage, for a total storage of 472,800 ac-ft at the top of the flood-control pool elevation of 1,099 ft. No post-construction surveys of the pool have been made since the pool was filled because the pool is 300–400 ft deep near the dam, and until recently, surveying equipment adequate to reach these depths was not available. Surveys were conducted in 2009. Modern equipment now exists to adequately survey at the depths required at Carters Lake. The surveys should be obtained and analyzed to decide if an update of the area/capacity curve would be warranted.

2.2.2.9 R.L. Harris Lake

R.L. Harris Lake is in the Alabama counties of Randolph and Clay. The lake has a surface area of 10,661 ac at a normal summer pool elevation of 793 ft. Construction was completed in 1983, and no sedimentation studies have been done on R.L. Harris Lake. However, because of the relatively recent completion date and other erosion/sedimentation data developed for other locations, it is reasonable to assume that the existing area/capacity relationship would be adequate for modeling purposes.

2.3 Aquatic organism passage at dams, particularly in the upstream direction.

Use of locks to aid in fish passage are currently being implemented and evaluated in cooperation with the Service, the Nature Conservancy, Auburn University and others. Other studies to define target species and investigate the feasibility of providing passage at select facilities are important, but beyond the scope of the current effort.

2.4 Temperature effects on species of concern from reservoirs and hydroelectric operations.

No studies were conducted for the DEIS for the WCM update. As new information becomes available adaptive management will be implemented. Water temperature changes that would be expected were described in Section 2.2. The effects of these potential changes on aquatic biota are further evaluated and presented in section 6.5 of the PDEIS.

2.5 Minimum flows available for Weiss bypass channel.

The USACE does not have control over the Weiss Bypass Channel. The minimum flows during the summer at this location should be discussed with FERC.

2.6 Conservation and recovery of natural flow variability, and reduction of effects of hydropower peaking flows on species of concern.

A return to "natural" (pre-dam) flow variability is not attainable or desirable given other Congressionally authorized purposes of hydropower, flood control, and recreation. The need for seasonal minimum flows is addressed at Carters via a minimum monthly flow release target from the re-regulation pool as part of the Proposed Action. At Lake Allatoona, where there is no re-regulation pool, implementation of a non-hydropower peaking operation for a natural flow regime would require a shutdown of hydropower production at the facility for a specified period of time. This would necessarily occur since there is no possible gradation of water releases between the "off" (0 cfs) and "on" (~3500 cfs) conditions per main hydropower unit. Such a shutdown is not considered practicable given that hydropower production is an important component of the regional power grid.

2.7 Maintenance of floodplain connectivity to flood pulses.

Studies are not currently available to address this question because there is no Lidar in non-reservoir sections of the Basin. USACE can provide stage and flow data but does not know what flows may be required.

Dedicated studies evaluating the effects of management actions on floodplain connectivity are not currently available. However, section 6.5.1 of the PDEIS will review the implications of the proposed management actions for the WCM update. USACE can provide stage and discharge data, but a comprehensive geomorphological assessment is necessary to determine the extent of flood pulses necessary to establish connectivity.

2.8 Potential for reintroductions, enhancements of listed species populations in the basin.

Reintroduction of species and enhancement of habitat for Federally listed species is beyond the scope of the current Water Control Manual update. Surveys for species and habitat for the proposed action have been coordinated with the Service and have been recently completed.

In 2010, the Corps sponsored a survey of mussel species in selected reaches of the Coosa River drainage in Georgia (Dinkins and Hughes 2011), representing the most comprehensive study of T&E mussels in the basin since Williams and Hughes (1998). The Corps has worked closely with the FWS and APC during the development of the updated WCM to ensure both stakeholders concerns are addressed. We will continue this high level of communication and collaboration as opportunities for adaptive management and further study arise.

Dinkins, G and M. H. Hughes. 2011. Freshwater mussels (Unionidae) and aquatic snails of selected reaches of the Coosa River drainage, Georgia. Dinkins Biological Consulting, Powell, TN. January 2011.

Williams, J. D., and M. H. Hughes. 1998. Freshwater mussels (Unionidae) of selected reaches of the main channel rivers in the Coosa drainage of Georgia. U.S. Geological Survey, Florida, Caribbean Science Center, Gainesville, Florida. October 1998.

2.9 Restoration and maintenance of healthy water quality parameters for all life stages of aquatic species under a variety of flow conditions.

Species specific habitat and water quality requirements are lacking for many aquatic organisms inhabiting the ACT basin. Even fewer data are available to describe ontogenic shifts with respect to these environmental parameters. As such, dedicated studies of key species, including T&E or recreationally important species, should be undertaken to address this data need; however, the level of effort needed to accomplish this is beyond the intent of the current work.

As illustrated in Figure 2.2-15 and described in section 2.2, a large percentage of mainstem reaches in the ACT Basin meet current water quality standards. Section 6.5.3 of the DEIS will review the proposed management alternatives and the implications of water quality changes on aquatic biota. As previously stated, the Corps will continue to work closely with stakeholders in adaptive management and seek opportunities for further study.

2.10 Development of adaptive management protocols that include goals, objectives, research, and monitoring to allow greater understanding of riverine ecosystem response to complex variables.

Although we are not opposed to adaptive management to achieve specific objectives, when possible, the development of research and monitoring efforts goes beyond the stated scope of the current water control manual update, and therefore cannot be addressed in the DEIS.

Appendix VI: Corps' November 22, 2011, response to the Service's questions regarding the Corps' June 6, 2011 document.

Questions for the Corps regarding their June 6, 2011, Response to USFWS ACT PAL

1. Page 10: When would be the dates of the seasonal navigation releases? Please tell us if this will be a guaranteed minimum flow or if it will be only "as requested" by navigation interests. What will be the time span for these navigational releases, e.g., days or months?

   RESPONSE: There would not be seasonal navigation releases in the sense that navigation would be supported only during a specified range of dates. Instead, the Corps and APC would make releases on the Alabama River at any time that sufficient water were available to support navigation. The amount of water required to support navigation has been calculated for both a 9-foot channel and for a 7.5-foot channel for each month during the year. That volume of water varies because of an assumption that annual maintenance dredging will occur on the river. As the channel fills with sediment after dredging, through the year and up to the next dredging event, increasing volumes of water are required to provide a 7.5- or 9-foot channel. Once the dredging event occurs, the required volume declines.

   Because navigation requires large volumes of water to maintain the specified channel depths, adequate water would only occur during normal hydrologic conditions and drought conditions would require the suspension of those releases. Therefore the concept of a guaranteed minimum flow during normal hydrologic conditions would not apply since the required navigation flows would be much greater than typical environmental minimum.

   The required flows for each month are determined from the following tables. JBT goal is the combined Jordan-Bouldin-Thurlow flow and is essentially the same as the flow at Montgomery. As an example, from Table 1-1, in January a flow rate of 9,950 cfs would be required to support a 7.5-foot channel below Claiborne dam and to support that flow an APC release at JBT of 7,960 cfs would be required. Tables 1-2 and 1-3 show the basin inflows that would be required to meet those targets. Because the APC reservoirs historically have had storage available for release or requirements for refilling (shown as negative numbers) the basin inflows may be lesser or greater than the navigation target.

Table 1-1 Monthly Navigation Flow Target in CFS

Month	9.0-ft target below Claiborne Lake (cfs)	9.0-ft JBT goal (cfs)	7.5-ft target below Claiborne Lake (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	11,075	8,880	9,740	7,792
Jun	10,550	8,480	9,530	7,624
Jul	10,025	8,080	9,320	7,456
Aug	9,500	7,680	9,110	7,288
Sep	9,500	7,280	8,900	7,120
Oct	9,500	7,280	8,900	7,120
Nov	11,600	9,280	9,950	7,960
Dec	11,600	9,280	9,950	7,960

Table 1-2 Basin Inflow Above APC Projects Required To Meet A 9.0-Ft Navigation Channel (cfs)

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	8,880	–499	9,379
Jun	8,480	412	8,068
Jul	8,080	749	7,331
Aug	7,680	1,441	6,239
Sep	7,280	1,025	6,255
Oct	7,280	2,118	5,162
Nov	9,280	2,263	7,017
Dec	9,280	-994	10,274

Table 1-3 Basin Inflow Above APC Projects Required To Meet A 7.5-Ft Navigation Channel (cfs)

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	7,792	–499	8,291
Jun	7,624	412	7,212
Jul	7,456	749	6,707
Aug	7,288	1,441	5,847
Sep	7,120	1,025	6,095
Oct	7,120	2,118	5,002
Nov	7,960	2,263	5,697
Dec	7,960	-994	8,954

2. Page 29: Why would there be such oxygen differences from the no action alternative just below Carters in Figure 2.1-7? Figure 2.1-7 is during a dry year, so wouldn't they most likely be releasing a Zone 2 240 cfs flow under the proposed action alternative? That would seem to be the same type of release as under the no action alternative for a dry year.

RESPONSE: The oxygen differences from the no action alternative stem from the modeled values occurring in the Carters Reregulation Pool. As seen in the following two figures (2-1 and 2-2), the Reregulation Pool water surface elevation can be distinctly lower during dry years compared to normal and wet years, leading to lowered modeled DO values.

The other figures that follow (Figures 2-3, 2-4, 2-5 and 2-6) show the DO levels and pool water surface elevations for wet and normal years respectively. During normal years, little change would be expected except under rare occurrences (5% occurrence).

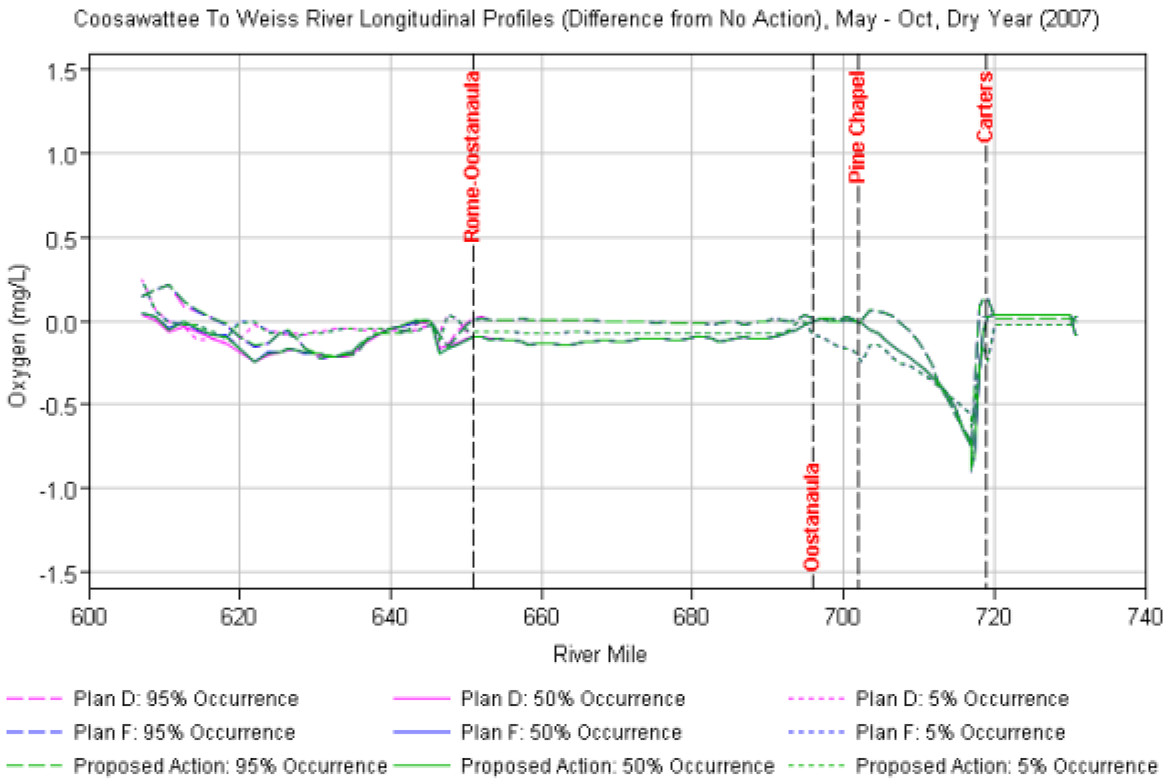


Figure 2-1. Oxygen longitudinal profile for May to October in a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

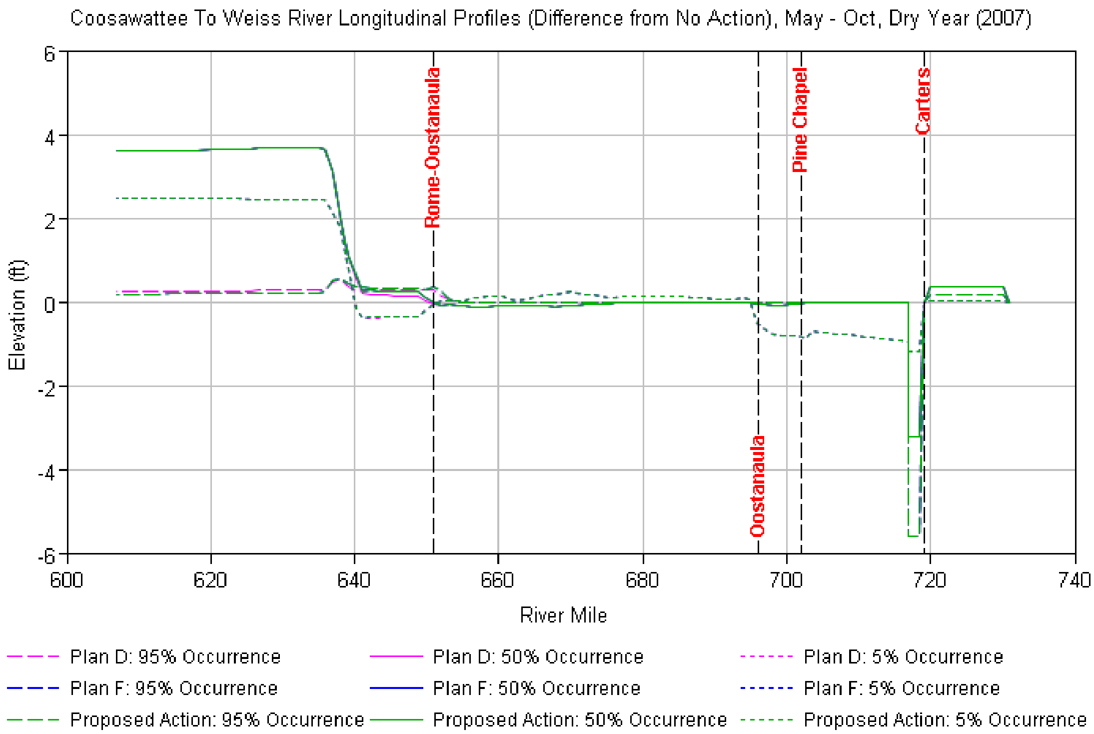


Figure 2-2. Water surface elevation longitudinal profile for May to October in a representative dry-weather year (2007) from Carters Lake downstream to Weiss Lake.

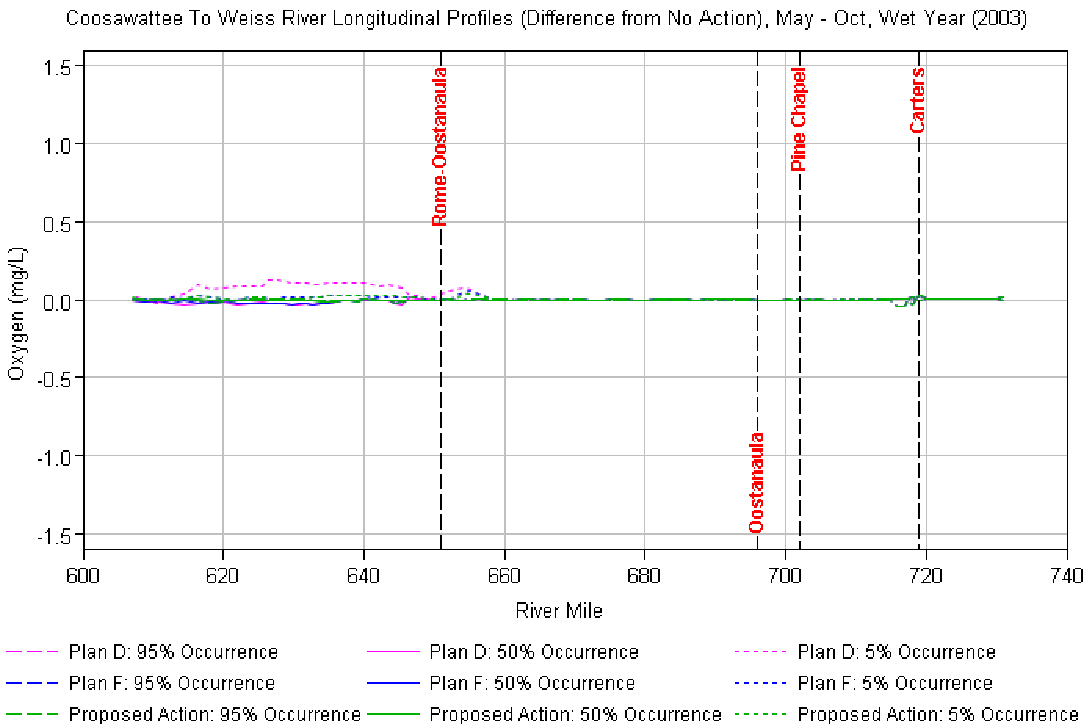


Figure 2-3. Oxygen longitudinal profile for May to October in a representative wet-weather year (2003) from Carters Lake downstream to Weiss Lake.

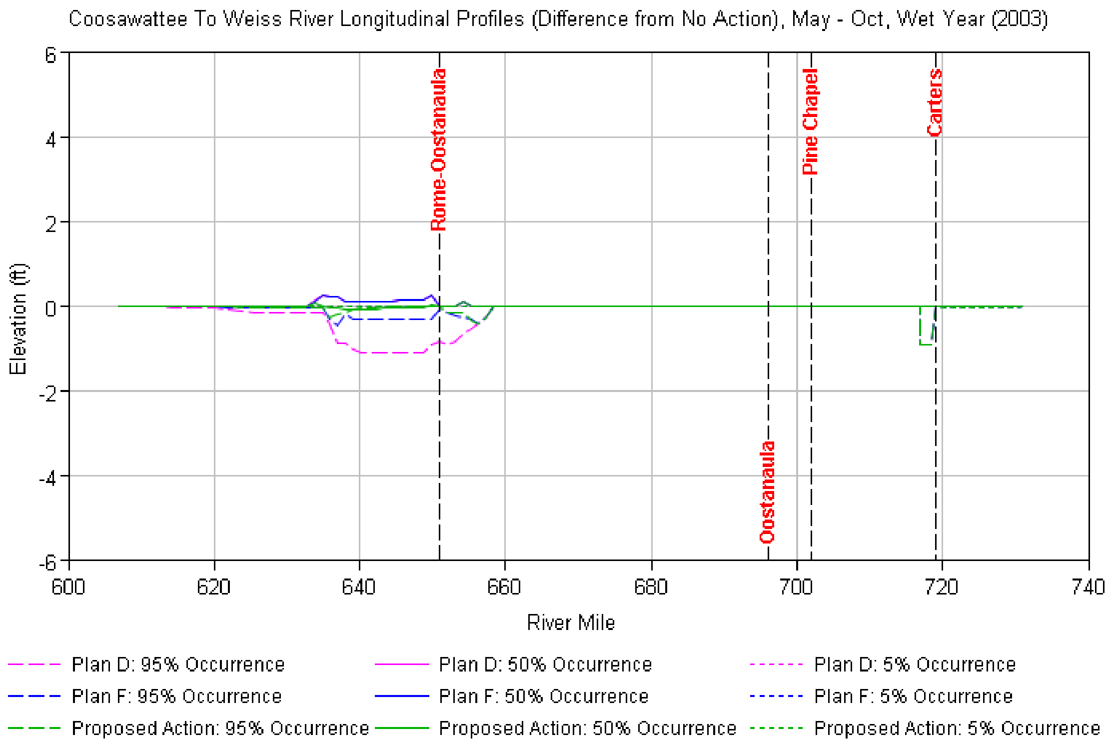


Figure 2-4. Water surface elevation longitudinal profile for May to October in a representative wet-weather year (2003) from Carters Lake downstream to Weiss Lake.

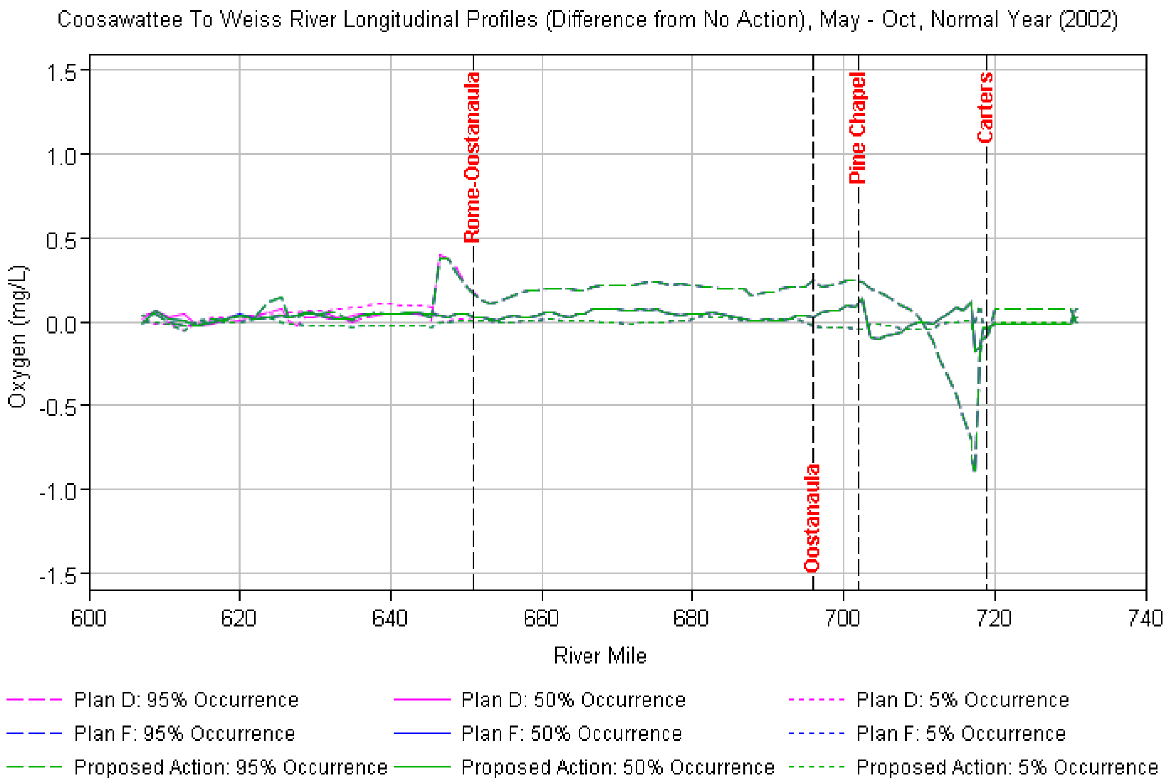


Figure 2-5. Oxygen longitudinal profile for May to October in a representative normal-weather year (2002) from Carters Lake downstream to Weiss Lake.

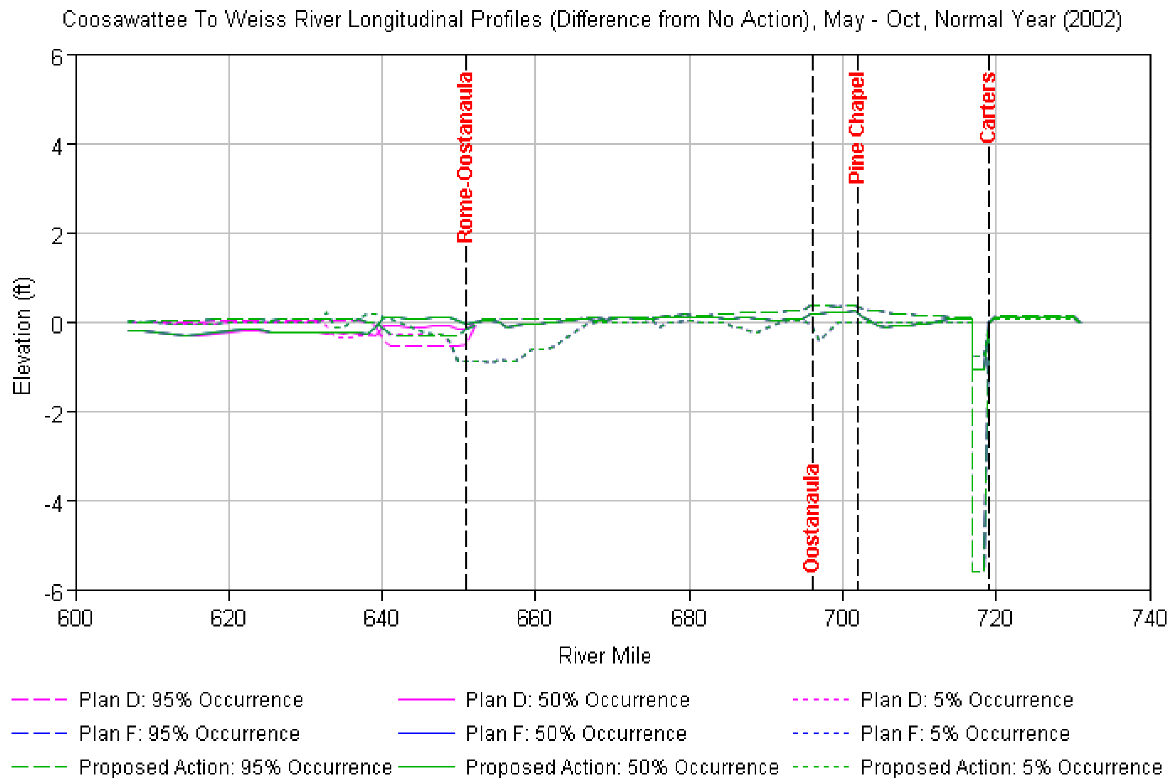


Figure 2-6. Water surface elevation longitudinal profile for May to October in a representative normal-weather year (2002) from Carters Lake downstream to Weiss Lake.

3. Page 29: We need to see a similar plot for the same stretch of river as in Figure 2.1-7, but for when Carters is operating under Zone 1 in the proposed action alternative (probably wet and normal years). I'm assuming Figure 2.1-7 represents Carters operating under Zone 2 in the proposed action alterative.

   RESPONSE: Plots provided in response to Question 2.

4. Page 29: We need to see similar plots as in Figure 2.1-7, but for the Etowah to Weiss stretch of river for dry and wet years.

   RESPONSE: During dry-weather conditions, similar to 2007, oxygen in the Etowah River could be reduced because of changes in stream flow and the ability to assimilate nutrients when compared to the No Action Alternative. In the Etowah River during dry-weather conditions around RM 680, where the greatest deviations from No Action Alternative would be expected, changes in DO are shown in the modeled results but are still expected to meet State water quality standards. In extreme dry-weather *conditions concentrations would be expected to increase by nearly 0.4 mg/L (Figure 4-1); that would be expected to benefit aquatic life during critical periods. Figures 4-2 and 4-3 present normal and wet years respectively.*

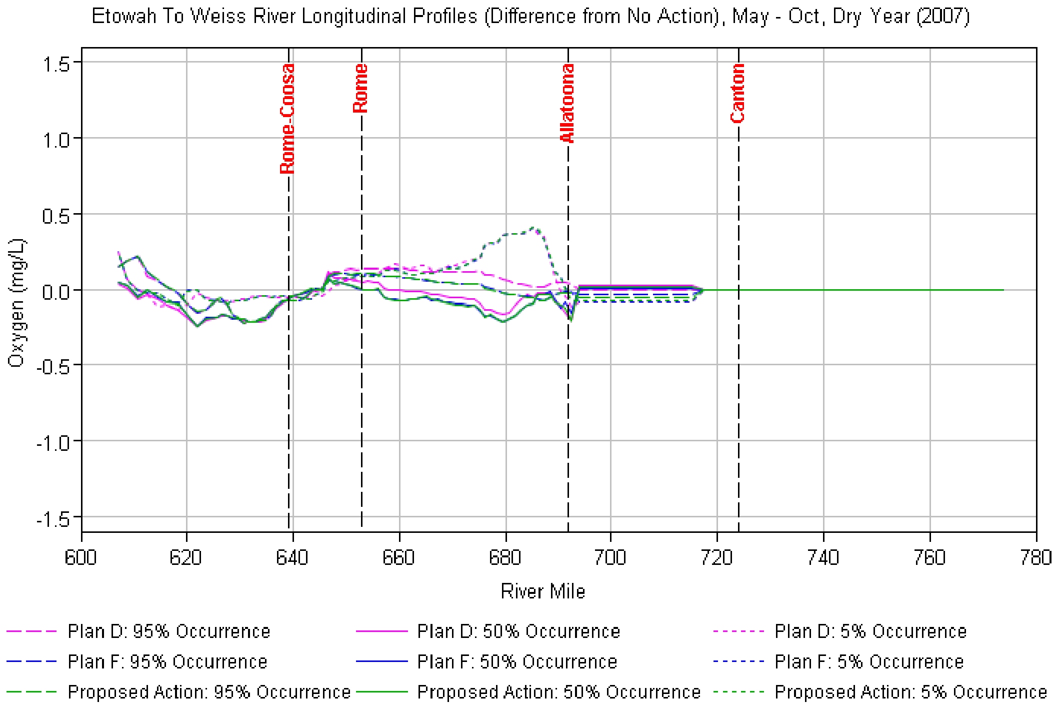


Figure 4-1. Etowah River oxygen longitudinal profile for May to October in a representative dry-weather year (2007).

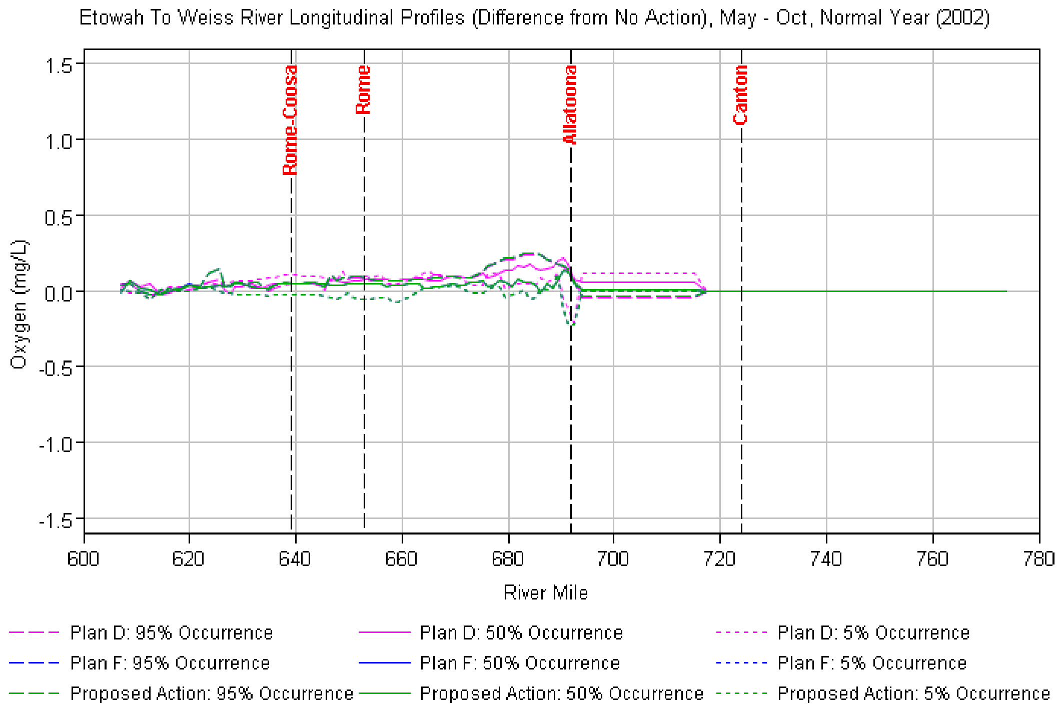


Figure 4-2. Etowah River oxygen longitudinal profile for May to October in a representative normal-weather year (2002).

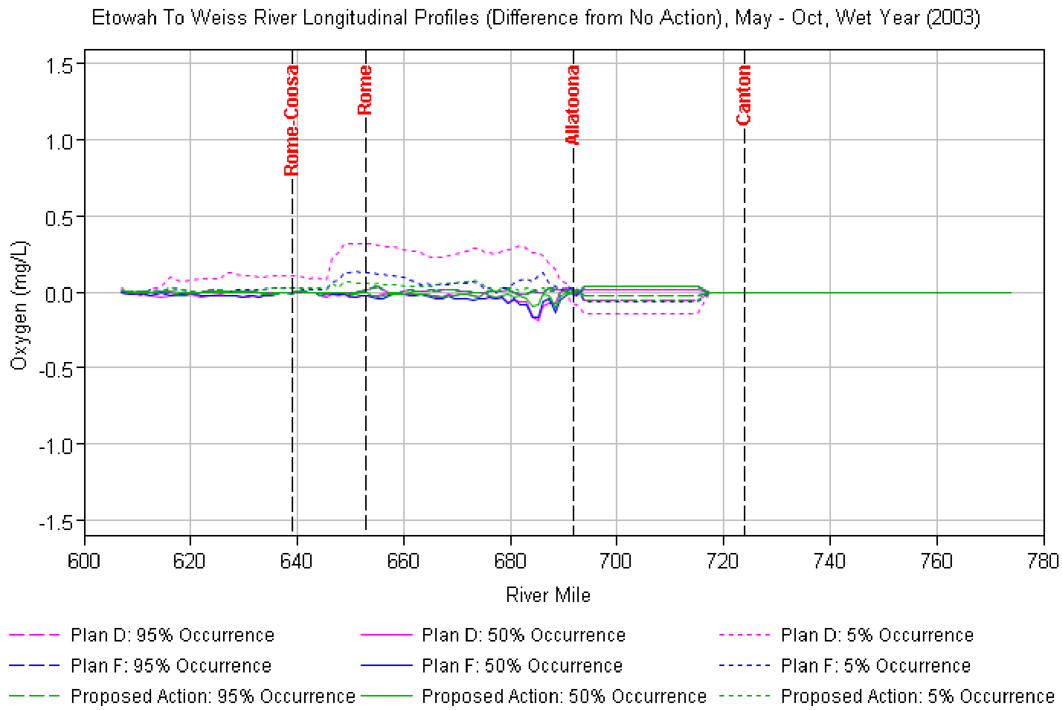


Figure 4-3. Etowah River oxygen longitudinal profile for May to October in a representative wet-weather year (2003).

5. How was the RES-SIM model developed and how well do it's (ie. the baseline) conditions represent actual operations? Has this type of assessment been completed, specifically for parameters that are biologically relevant? Could the model output be updated through 2010?

RESPONSE: The ResSim model development was a collaborative effort involving the Hydrologic Engineering Center (HEC-developers of ResSim), Alabama Power Company (APC-owner of 11 dams) and Corps of Engineers (owner of remaining 6 dams). In 2006 Mobile District began working with HEC to create ResSim watershed models based on established HEC-5 models simulating 1977, 1995, and 2008 physical and operational conditions. The three HEC-5 models hold significance as the tools "of record" used for analyses concerning the previous Environmental Impact Statement and the 1990's Comprehensive Study. After ensuring that the corresponding ResSim models could effectively reproduce the HEC-5 results, Mobile District, APC and HEC created another ResSim model that captured the most significant operations as of 2008. This model was presented to stakeholders in October 2008 and generally accepted as a promising improvement to ACT reservoir system modeling. Refinements to the model and inclusion of ResSim software enhancement occurred for the next two years. The final model was presented to the Stakeholders at the May 2011 modeling overview session. The Baseline Condition represents continuation of the current water control operations at each of the federal projects in the ACT Basin. The Corps' operations have changed incrementally since completion of the 1951 ACT Master Manual. Each operational rule within the model was evaluated based on meeting the intended purpose. Some example operational rules include minimum flow requirements, hydropower demand, fish spawning support, flood control and water supply. The model is not expected to exactly match actual operations. Real-time operation includes continuous adjustment to basin wide conditions that incorporate the flexibility within the water control manuals. However, when comparing the model and current operation, *the timing of reservoir changes and response to hydrologic conditions are the same. Several comparisons that include reservoir levels and releases, stream flows and generation were evaluated to ensure the rules captured the intent.*

The current modeling cannot be updated to include 2010 until the unimpaired flow data set is update. Efforts to update the unimpaired flow will not begin until Spring 2012.

6. As is being done in the ACF, are you using 2007 demand data and a 10 to 15-year WCM planning window for the WCM update process? If so, what is your reasoning for assuming that future water supply demands would remain constant with 2007 demand data?

   RESPONSE: For the Corps projects and other parts of the basin, water demand for modeling is based on the highest demand year under existing storage contracts. In the ACT that year was 2006 (2007 for ACF). Although basin water use will generally be greater with future population growth, there is no assumption in our modeling providing for potential reallocations or new contracts that could be implemented or the source of future water supply. Projecting future water storage contracts or withdrawals from Corps reservoirs would be speculative without detailed analysis of many variables including population projections, conservation efforts, groundwater and regional reservoir development, etc. and was beyond the scope of the current effort.

7. For the water quality analyses, is it appropriate to have all dry years represented by 2007 and normal years by 2003?

   RESPONSE: HEC5-Q simulations were limited to 2000-2008 time period. Separate years were selected to represent wet, dry and normal hydrologic conditions. It is appropriate to select a year within the simulation to analyze typical impacts for hydrologic conditions such as dry, normal or wet. Given that the modeled output are presented to understand system-wide changes the representative years where held constant. See the response to Question 8.

8. The terms dry, wet and normal years are used without clear explanation regarding what constitutes these designations. This needs to be made very clear. How were they defined, and does the term "rainfall conditions" actually mean a discharge-related variable?

   RESPONSE: For the purposes of the water quality analysis the dry, wet, and normal years were based on seasonal flows. Table 8-1 presents the total flow and volume at three locations in the basin for the water quality modeled period. The range of flows during that time was representative of similar time periods for which records exist and representative of the hydrologic historical data generally. Therefore, the individual years were grouped as dry, wet or normal based on their ranking within the modeled period.

Table 8-1. Baseline ResSim flows from April – November

	Apr-Nov flow cfs-day	Acre-feet

Key: Dry **Normal** **Wet**

Coosa State Line

2007	51179	101,513
2008	73894	146,567
2000	101387	201,098
2006	130694	259,228
2001	173033	343,206
2002	197664	392,062
2004	321745	638,172
2005	372080	738,010
2003	488511	968,947

Tallapoosa JBT goal

2008	250808	497,471
2000	375230	744,257
2006	557077	1,104,946
2007	576868	1,144,201
2002	608689	1,207,316
2001	707346	1,403,000

2004	880075	1,745,602
2005	1661516	3,295,570
2003	1955839	3,879,350

Alabama River Pulp

2007	1438549	2,853,320
2000	2006368	3,979,573
2008	2237304	4,437,628
2006	2871352	5,695,243
2002	3764203	7,466,187
2001	3786927	7,511,261
2004	5382016	10,675,073
2005	8844107	17,542,031
2003	10075127	19,983,724

9. How do water demands, current and future, change with Georgia reservoirs: Hickory Log Creek, Russel Creek, Richland Creek, Shoal Creek, and Calhoun Creek? These do not appear to be included in the PAL response analysis.

   RESPONSE: The projects listed are proposed, except for Hickory Log Creek which is now completed. The water control plan analysis only considers current water demands. Attempts to make such analyses would require speculation regarding the eventual size, construction, withdrawals and other variables as described in answer to question 6 above.

10. Why are there no guide curves for Claiborne Lake, W. Dannelly Lake, and R E Woodruff Lake (R F Henry Lock and Dam)? In the preferred alternative will all guide curves stay the same as the No Action alternative except H Neely Henry and Lake Allatoona?

    RESPONSE: Guide curves are not established at the three Alabama River Lakes because of the lack of available storage and lack of flood control operations. These projects are considered run-of-river, i.e. water is generally passed as it is released from the upstream APC projects with only very limited ability to store and release that water at a future time.

11. Why is the Weiss Bypass minimum flow issue out of the scope of the project? It requires COE water to flow into APC jurisdiction.

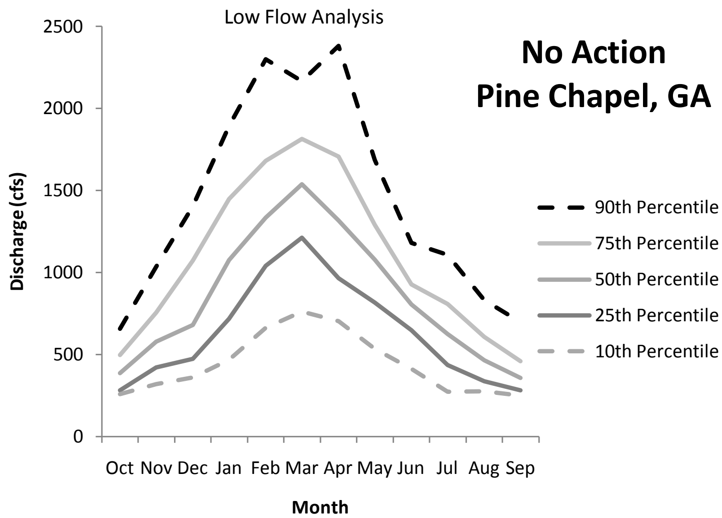
RESPONSE: The regulation of Weiss Bypass minimum flows is under the direct jurisdiction of the FERC license and controlled by releases by APC. Although water from the upstream Corps projects enters Weiss Lake there are also inflows from tributaries downstream of the projects. As such there is no direct dependence upon specific flow at the Corps projects for the flow APC provides to the bypass.

12. Similar to 'note for talking with Will': Why is there no IHA analysis?

RESPONSE: In response to this request, IHA was evaluated as described below.

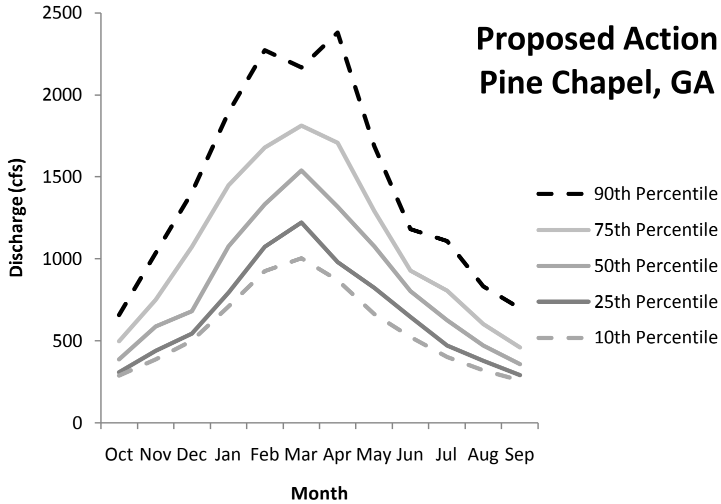
- *IHA was run at three locations.*
    1) *Pine Chapel, GA*
    2) *Etowah at Rome, GA*
    3) *Oostanaula at Rome, GA*
- *High and low analyses based on FWS spreadsheets were run at the same locations*
- *Analyses based on previous feedback from FWS on ACF using spreadsheets provided by FWS. Spreadsheet analyses are available upon request, but not provided at this time due to large size (>200 megabyte total).*
- *Analysis represents RES SIM modeled output from 10/1/1939 through 9/30/2008*
- *Results are summarized in the following three figures.*

Pine Chapel, GA



High Flow Analysis

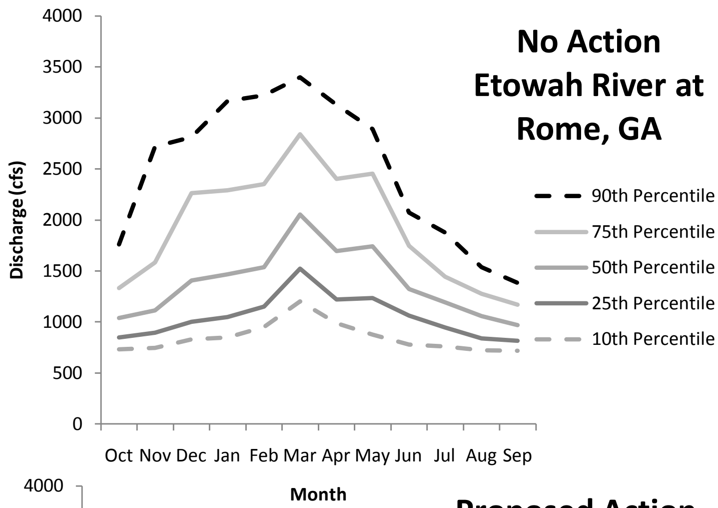
Pine Chapel, Georgia No Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	1751.54	7671.26	10317.16
Magnitude	2039 -4138	7920 -9346	10733-11341
Frequency	4-8	0-1	$\geq$ 10 year RI
Duration	3-12	22-38.5	26-98.5
Rise Rate	169-545	414-1075	525-1154
Fall Rate	169-415	213-592	175-712
Timing	Annually	Nov - Apr	Dec - Mar

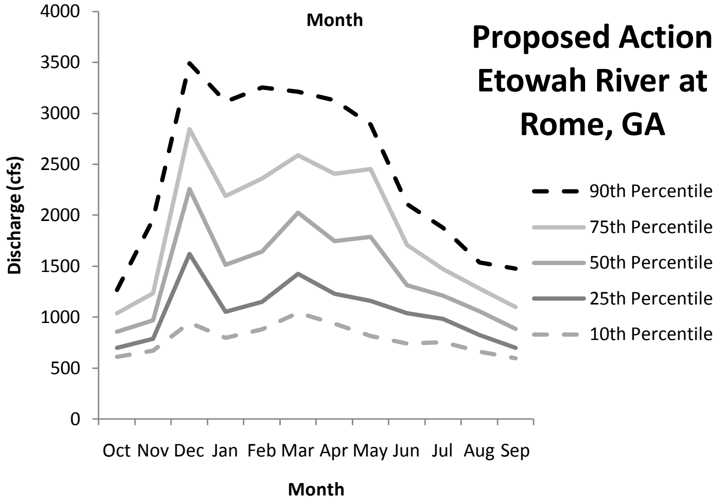


Pine Chapel, Georgia Proposed Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	1742.29	7671.26	10317.16
Magnitude	1972-4072	7921-9346	10733-11342
Frequency	4-8	0-1	$\geq$ 10 year RI
Duration	3-12	22-38.5	26-98.5
Rise Rate	153-499	414-1060	525-1154
Fall Rate	152-394	213-592	175-712
Timing	Annually	Nov - Apr	Dec - Mar
Date Range	10/1/1939	to	9/30/2008
User inputs data in orange cells.			

Etowah River at Rome, GA

Low Flow Analysis

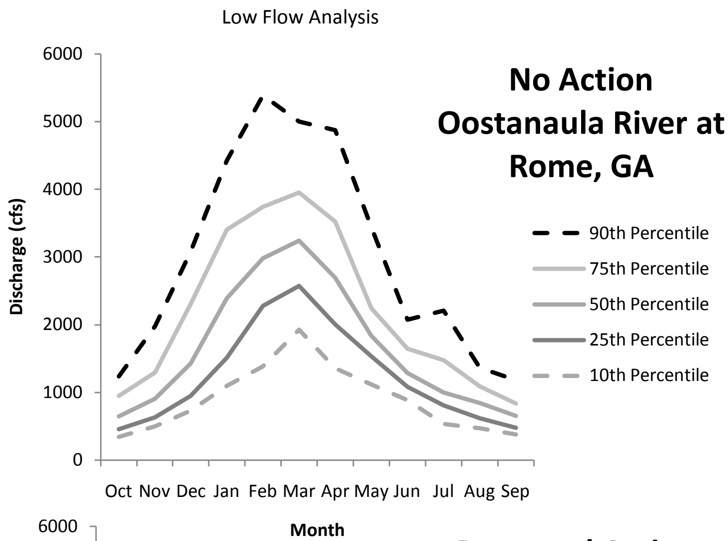


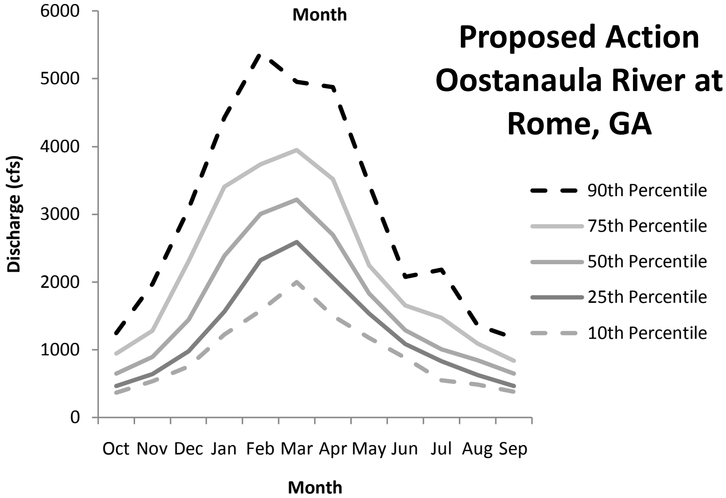


High Flow Analysis

Etowah River at Rome, Georgia No Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	2862	11289	13287
Magnitude	3038-4591	8366-9461	10970-12213
Frequency	4-8	0-1	> 10 year RI
Duration	3-8	10-23.25	20.25-40.75
Rise Rate	186-524	714-1332	440-1287
Fall Rate	199-495	463-1324	346-823
Timing	Annually	Jan - May (more than 2 per month)	Oct - Apr (more than 2 per month)

Etowah River at Rome, Georgia Proposed Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	2923.60	11324.96	13287.49
Magnitude	3381-6949	11526-12273	13503-14683
Frequency	4-8	0-1	> 10 year RI
Duration	4-12	18.25-51.75	44.5-70.5
Rise Rate	271-829	416-1561	404-974
Fall Rate	235-657	332-839	259-391
Timing	Annually	Nov - Apr (more than 2 per month)	Feb - Mar (more than 2 per month)
Date Range	10/1/1939	to	9/30/2008
User inputs data in orange cells.			





Oostanaula River at Rome, GA

High Flow Analysis

Oostanaula River at Rome, Georgia No Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	4101	23042	33456
Magnitude	5022-11898	24240-28782	35821-40018
Frequency	4-8	0-1	> 10 year RI
Duration	4-13.5	24.5-54.5	30.25-41.5
Rise Rate	471-1235	912-2624	1428-3731
Fall Rate	441-1151	864-1906	1170-2233
Timing	Annually	Dec - Apr (more than 2 per month)	Jan (more than 2 per month)

Oostanaula River at Rome, Georgia Proposed Action Alternative			
	High pulse	Small Flood	Large Flood
Threshold used	4090	23042	33456
Magnitude	4999-11815	24240-28782	35821-40016
Frequency	4-8	0-1	> 10 year RI
Duration	4-13	24.5-54.5	30.25-41.5
Rise Rate	468-1214	912-2624	1429-3730
Fall Rate	440-1145	864-2052	1170-2233
Timing	Annually	Dec - Apr (more than 2 per month)	Dec - Mar (more than 2 per month)
Date Range	10/1/1939	to	9/30/2008
User inputs data in orange cells.			

Questions for the Corps regarding their June 6, 2011, Response to USFWS ACT PAL - Continued

1. If available, please provide us with the agreement between SEPA and the Corps for hydropower generation in the ACT for Fish and Wildlife Service's records.

   RESPONSE: The Memorandum of Understanding with amendments is being provided separately.

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2. It would be valuable to us to have an analysis showing the hydrologic differences between the no action and the proposed action alternative in terms of the timing, duration, and magnitude of high and low flows. Can this be provided?

   RESPONSE: Refer to IHA analysis in response to Question 12 above.

3. Do you have data or information that shows the efficacy of the fish spawning operations in Lake Allatoona?

   RESPONSE: No data is available. In the past this data has been requested from Georgia DNR but has not been received. However, other studies indicate that high water levels inundating shoreline vegetation during spawning periods frequently have been associated with enhanced reproductive success and strong year class development for largemouth bass, spotted bass, bluegill, crappie, and other littoral species. Conversely, low or declining water levels can adversely affect reproductive success by reducing the area of available littoral spawning and rearing habitats. Therefore, we conclude that fish spawning operations have had a beneficial impact on recreational fisheries.

4. We note that hydrologic data from 2008 to 2010 have not been incorporated into modeling efforts we have reviewed. Would incorporation of these data likely change any results or interpretation?

   RESPONSE: Expanding the flow record to include 2009 and 2010 calendar years, would not impact the results. The most critical recorded periods are within the 70 year period, 1939-2008.

5. Could an approach to improve water quality below Corp projects be provided? This information does not appear to be included in the response to the PAL.

Response: In general, DO and temperature are the parameters most impacted by the Corps projects, as discussed in the PAL and in the response. Those impacts are due to factors inherently associated with large reservoirs in general and with the projects specifically, such as lake stratification, depth of release water, minimum flows and hydropower generation. We believe that the proposed operational update would have few if any negative impacts to water quality and some potential benefits. As discussed in section 1.2 of the response, a revised seasonal minimum flow is proposed at the Carters re-reg dam that would provide water quality benefits. Beyond that, for reasons discussed in sections 2.1, 2.4, and 2.6, we have not identified other operational methods that would achieve water quality improvement compared to the current operation without having other negative consequences. The Corps remains open to further discussion regarding specific recommendations for improving water quality at any of its projects.

6. On page 61, you state that "The effects of these potential changes on aquatic biota are further evaluated and presented in section 6.5 of the PDEIS." An evaluation of the effects of the proposed action are directly pertinent to our review and drafting of the FWCAR. The document supplied to us includes 62 pages through section 2.10. Can you provide us with Section 6.5 of the PDEIS and other related material?

RESPONSE: The requested section of the Draft EIS is being reorganized and edited and is currently unavailable. However, the following discussion contains our current analysis and contains the same information as that which is being used in the EIS preparation.

Fish and Aquatic Resources

Rivers

This summarizes the effects of alternative water management plans on biological resources in riverine portions of the ACT Basin. Results are based on HEC-ResSim model simulations of project operations under the alternative plans over a 70-year period of record (1939–2008). Descriptions of the likely effects of the current operation and the proposed action on riverine biota are presented for the following locations in the basin: (1) Coosawattee River downstream of Carters Reregulation Dam; (2) Etowah River downstream of Allatoona Lake; (3) Coosa River at Rome, Georgia; (4) Alabama River at Montgomery, Alabama; and (5) Alabama River downstream of Claiborne Lock and Dam.

Coosawattee River downstream of Carters Reregulation Dam

The following subsections describe the effects of the current operation and proposed action on stream flow and water quality conditions as they relate to biological resources in the Coosawattee River downstream of Carters Reregulation Dam. The No Action Alternative provides a requirement for a continuous minimum flow of 240 cfs downstream of Carters Reregulation Dam. The alternative plans include seasonally variable minimum flow targets consistent with recommendations made by the USFWS. Any fish and aquatic resources inhabiting this reach would be expected to experience no adverse effects.

Current Operation

USFWS has recommended seasonal minimum flow targets ranging from 240 cfs to 865 cfs (Table 6.1-1). The current operation would be expected to meet the recommended monthly targets from 76 percent of the time during October to as much as 90 percent of the time during June.

Water quality conditions are expected to improve under the current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. As such, there would be no adverse effects on fish and aquatic resources.

Table 6.1-1.
Coosawattee River downstream of Carters Reregulation Dam, seasonally variable minimum flow targets, percent of time targets would be met or exceeded

Month	Monthly minimum flow target (cfs)	Percent of time flow target would be equaled or exceeded	
		Current operation	Proposed operation
January	660	81%	98%
February	790	85%	98%
March	865	87%	98%
April	770	86%	97%
May	620	88%	96%
June	475	90%	94%
July	400	85%	95%
August	325	82%	95%
September	250	80%	97%
October	275	76%	98%
November	350	89%	98%
December	465	81%	97%

Proposed Action

HEC-ResSim model results indicate that adding the seasonally variable minimum flow targets would not yield significant changes in the mean daily flows over the period of record. However, notable improvements would be expected during low-flow events. Minimum flows of 240 cfs would occur only about 4 percent of the time, compared to 9 percent for the current operation. The proposed plan would be expected to meet the USFWS-recommended monthly minimum flows targets at least 94 percent of the time during all months of the year and as high as 98 percent during several months (Table 6.1-1). For example, flows in March and December would exceed the seasonal minimum targets during 98 percent and 97 percent of the days, respectively. Similarly, changes in water quality, with respect to temperature and DO values, would be expected to be negligible.

Thus, compared to the current operation, the effects of operational features on flow and water quality conditions under the proposed action would be negligible and not expected to adversely affect fish and aquatic resources in the Coosawattee River downstream of Carters Reregulation Dam.

Etowah River downstream of Allatoona Lake

The following subsections describe the effects of the current operation and proposed operation on stream flow and water quality conditions as they relate to biological resources in the Etowah River downstream of Allatoona Lake. Flow conditions are directly influenced by water management activities at Allatoona Lake. Under both alternatives, the Allatoona Lake project must meet the requirement to provide a continuous minimum release of 240 cfs. There would be no adverse effects on fish and aquatic resources inhabiting the Etowah River downstream of Allatoona Lake. In the figures that follow the current operation is labeled as ‘no action’ and the proposed action is labeled as ‘plan G’.

Current Operation

HEC-ResSim modeling over the 70-year period of hydrologic record (1939–2008) indicates a range of mean daily flows between 1,600 and 2,500 cfs from January through May, declining 1,000 to 1,300 cfs from June through September, and increasing to 1,300 to 2,300 cfs from October through December (Figure 6.1-1). An evaluation of a flow duration curve suggests that violation of the 240 cfs minimum flow requirement would occur less than one percent of the time. The Etowah River flow duration curves in September and December, periods in which key operational changes to Allatoona Lake are proposed, indicate that flows would be at the minimum level of 290 cfs about 28 percent of the time in September (Figure 6.1-2) and 15 percent of the time in December (Figure 6.1-3).

Water quality conditions are expected to improve under the current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. Overall, there would be no adverse effects on fish and aquatic resources.

Figure 6.1-1. Etowah River downstream of Allatoona Dam, average daily discharge (cfs) over the modeled period of record (1939–2008).

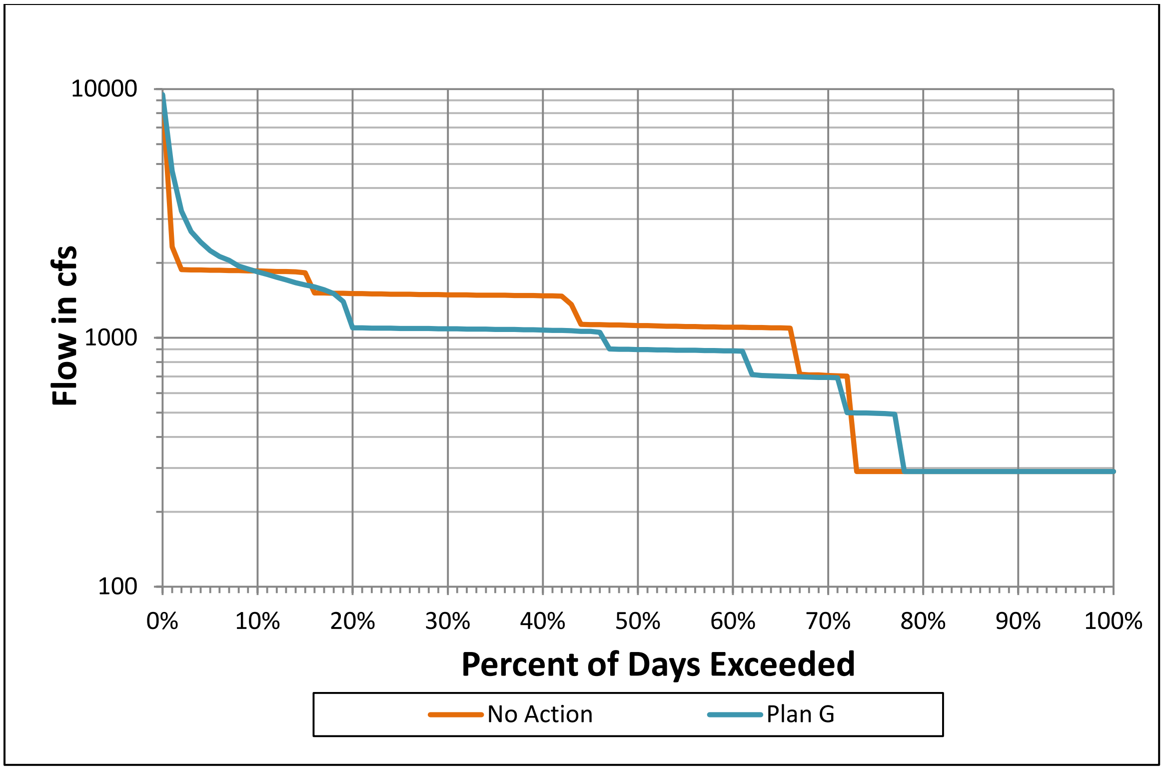

Figure 6.1-2. Etowah River downstream of Allatoona Dam, daily discharge (cfs)—percent of days exceeded for September over the modeled period of record (1939–2008).

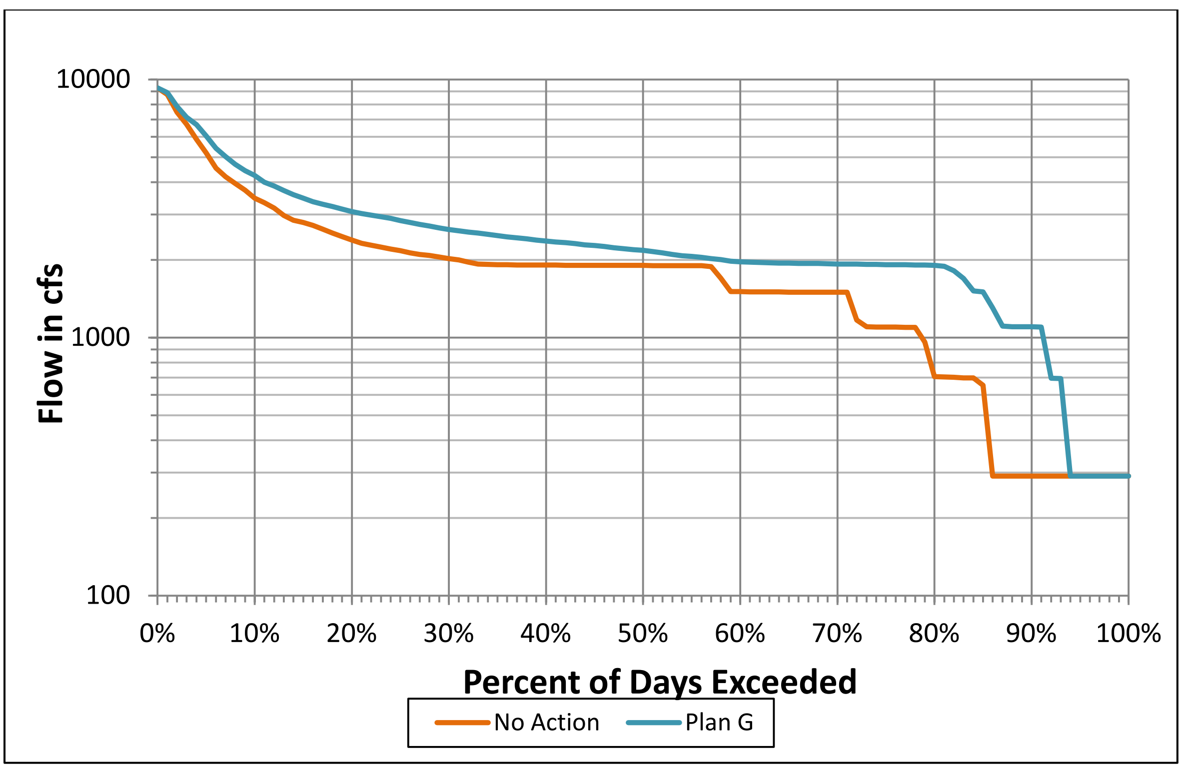

Figure 6.1-3. Etowah River downstream of Allatoona Dam, daily discharge (cfs)—percent of days exceeded for December over the modeled period of record (1939–2008).

Proposed Action

The proposed revision of the number (from two to four) and shape of the action zones under would be expected to temper full peaking hydropower releases during dry conditions to conserve storage. The phased guide curve and reduction of hydropower generation during the fall drawdown period would shift the timing of releases over an extended drawdown period between September and December. That would result in higher water levels in Allatoona Lake in October through December compared to the current operation. However, the overall effect on total releases over the duration of the drawdown period would be negligible. The expected increase in flows during December under the proposed action compared to the current operation should offset lower releases earlier in the phased drawdown period.

Implementing the phased guide curve at Allatoona Lake and reduction of hydropower generation during fall drawdown would be expected to have little effect on downstream water temperature and DO concentrations.

With respect to the current operation, the effects of operational features on flow and water quality conditions under the proposed plan would not be expected to affect fish and aquatic resources on the Etowah River downstream of Allatoona Lake.

Coosa River at Rome, Georgia

The following subsections describe the effects of the current operation and proposed plan on stream flow and water quality conditions as they relate to fish and aquatic resources in the Coosa River at Rome, Georgia. Flow conditions at that location are affected by water management activities at Carters Lake and Allatoona Lake. The proposed operational changes could change the quantity or timing of the downstream flow regime. Fish and aquatic resources inhabiting the Coosa River at Rome would experience only minimal adverse effects.

Current operation

Average daily flows under the current operation in the Coosa River peak at about 12,800 cfs by the end of March and decrease through late spring and summer to a minimum of approximately 2,700 cfs in September (Figure 6.1-4). The flow-duration curves for September and December were selected to help determine the effects of alternative water management measures for Carters Lake and Allatoona Lake (Figures 6.1-5 and 6.1-6). September values coincide with the low-flow period for the Coosa River at Rome and the beginning of fall drawdown at Allatoona Lake. The median flow value modeled over the period of record is 2,445 cfs. December presents higher flows, coinciding with the end of the drawdown period at Allatoona Lake. The median flow during that period is 4,769 cfs.

Water quality conditions are expected to improve under current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. Overall, there would be no adverse effects on fish and aquatic resources.

Figure 6.1-4. Coosa River at Rome (Georgia), average daily discharge (cfs) over the modeled period of record (1939–2008).

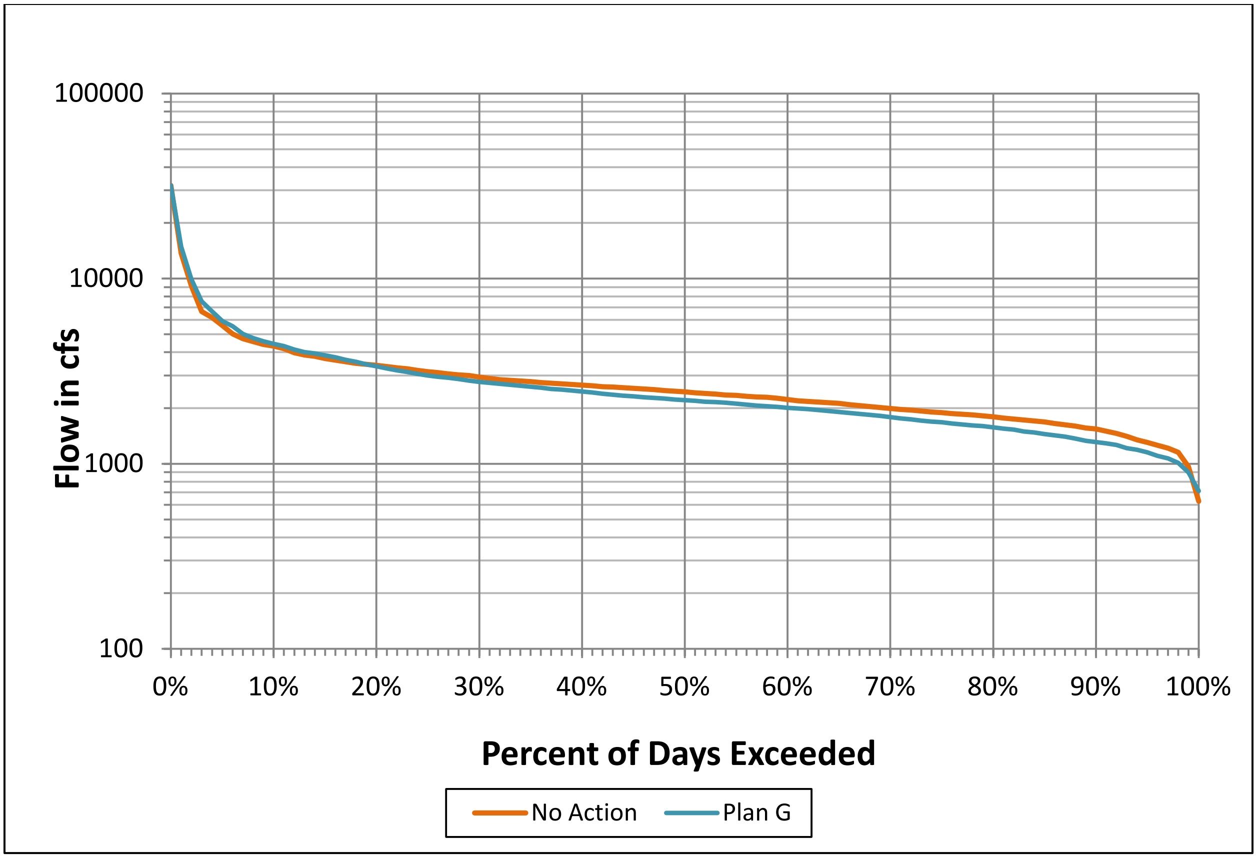

Figure 6.1-5. Coosa River at Rome, Georgia, daily discharge (cfs)—percent of days exceeded for September over the modeled period of record (1939–2008).

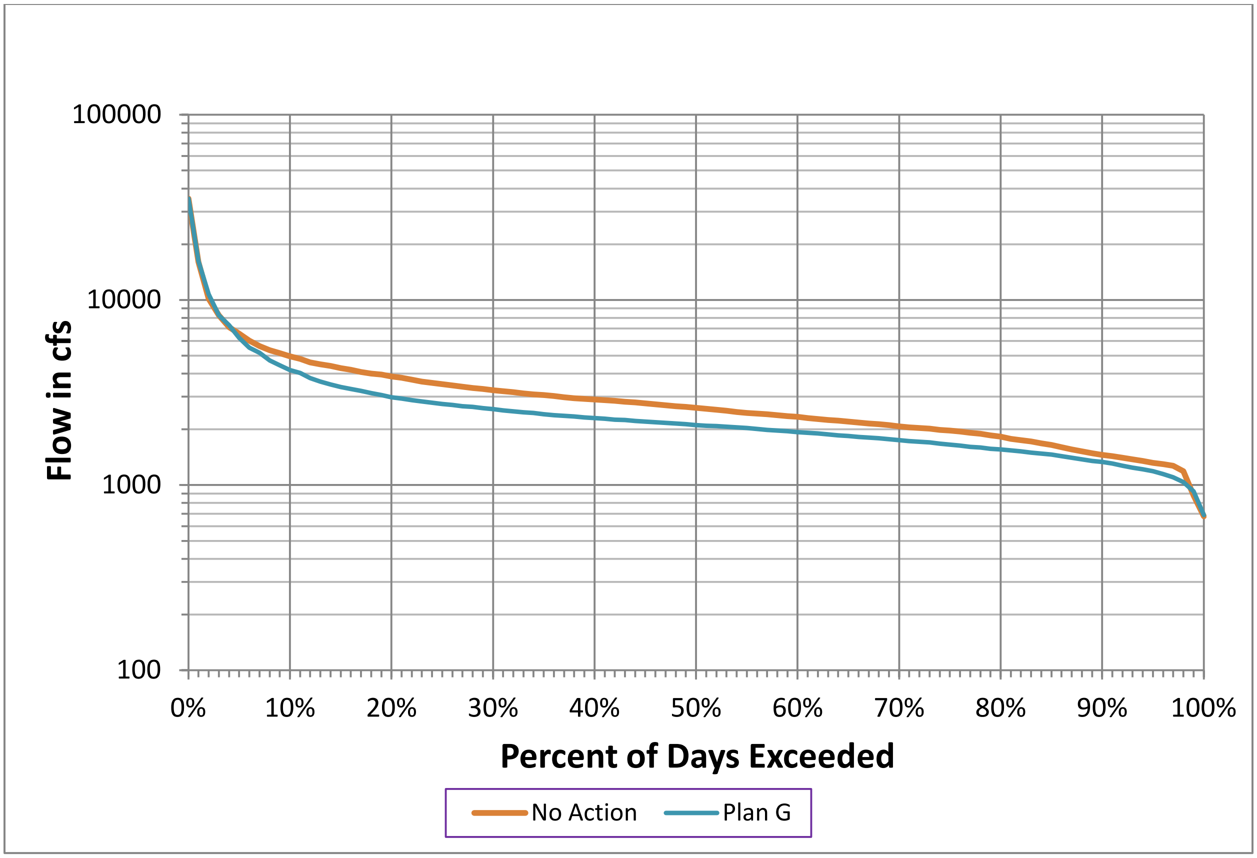

Figure 6.1-6. Coosa River at Rome, Georgia, daily discharge (cfs)—percent of days exceeded for October over the modeled period of record (1939–2008).

Proposed Action Alternative

Over the modeled period of record, the percent of days that proposed action and the current operation would likely exceed 7Q10 values is in the range of 86 percent or higher (Table 6.1-2). From January through July, values between the plans would be about the same. During August to November, the proposed action would reduce the number of days the Coosa River flows at Rome would exceed 7Q10 values from 2 to 4 percent below the current operation. In December, the proposed action would likely increase the number days the 7Q10 values would be exceeded by 4 percent over the current operation. Thus, the operational changes of the proposed operation, particularly the reduction in hydropower generation at Allatoona Lake during fall drawdown, would be expected to shift releases from September through December. However, the model suggests those changes would not significantly affect flow characteristics in the Coosa River at Rome compared to the current operation.

Compared to the current operation, the effects of operational features on flow and water quality conditions under the proposed plan would not be expected to affect fish or aquatic resources on the Coosa River at Rome.

Table 6.1-2.
Coosa River at Rome, Georgia—Percent of days (by month) over the modeled period of record (1939–2008) that flows would likely exceed 7Q10 value

Month	7Q10 flow value	Percent of days flow would exceed 7Q10 value

		Current operation	Proposed Action
January	2,544	92%	93%
February	2,982	93%	94%
March	3,258	97%	96%
April	2,911	93%	93%
May	2,497	92%	92%
June	2,153	92%	91%
July	1,693	93%	93%
August	1,601	91%	89%
September	1,406	93%	86%
October	1,325	94%	90%
November	1,608	92%	90%
December	2,043	93%	97%

Alabama River at Montgomery, Alabama

The following subsections describe the effects of the current operation and proposed action on stream flow and water quality conditions as they relate to fish and aquatic resources in the Alabama River at Montgomery, Alabama. Flow conditions at that location are mainly controlled by water management activities at APC projects upstream on the Coosa and Tallapoosa Rivers and are minimally affected by projects in the upper portion of the basin (e.g., Carters Lake and Allatoona Lake). A flow target (weekly average of 4,640 cfs) has been established at the location to meet navigation and waste assimilation objectives for the Alabama River downstream of Montgomery. It is also an important component of drought management and response. Fish and aquatic resources inhabiting the Alabama River at Montgomery would experience no adverse effects.

Current operation

Average daily flows over the 70-year modeled period of record indicate peak flows slightly above 46,000 cfs by the end of March, followed by a rapid decline to 15,000 cfs by the end of May, and a minimum level of about 8,600 cfs in early September (Figure 6.1-7). In the fall, average flows gradually increase to about 30,000 cfs by the end of December. The percent exceedance of flow levels ranges from approximately 900 cfs to 220,000 cfs (Figure 6.1-8). Under the current operation, the 4,640 cfs minimum flow target would be met 99 percent of the time.

Water quality conditions are expected to improve under the current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. Therefore, there would be no adverse effects on fish and aquatic resources.

Figure 6.1-7. Alabama River at Montgomery, average daily discharge (cfs) over the modeled period of record (1939–2008).

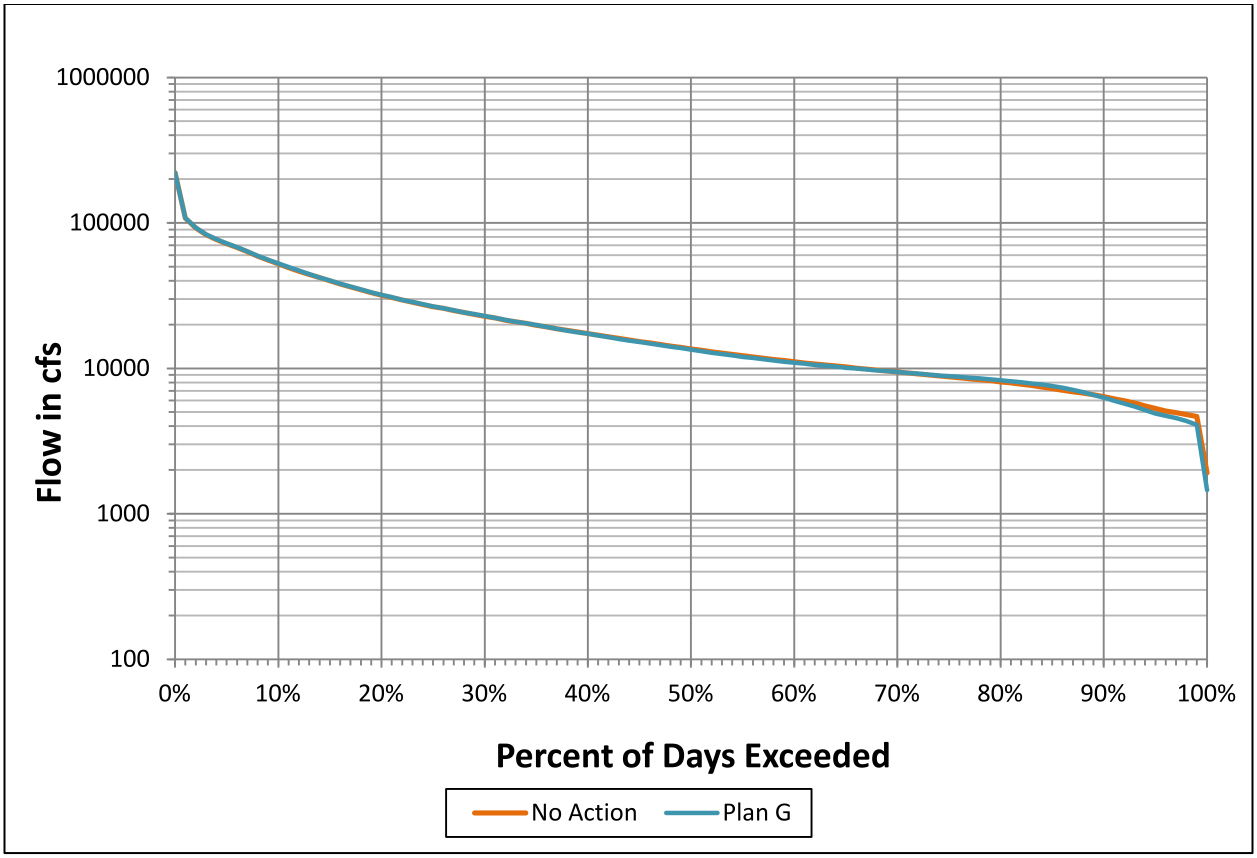

Figure 6.1-8. Alabama River at Montgomery, daily discharge (cfs)—percent of days exceeded over the modeled period of record (1939–2008).

Proposed Action Alternative

The effects of operational features on flow and water quality conditions under the proposed plan would result in adjustments designed to meet navigational needs when sufficient flows are available and would provide progressively more stringent drought management plans under dry conditions. Those objectives would be at least partially met by the proposed action with little change on overall flow characteristics of the Alabama River at Montgomery. Under the alternative, the minimum flow target would be expected to be met 96 percent of the time.

Because the reservoirs above the Alabama River at Montgomery have limited storage and function more as run-of-river operations, water quality parameters would not be expected to change.

With respect to the current operation, the effects of operational features on flow and water quality conditions under proposed action would not be expected to affect fish and aquatic resources on the Alabama River at Montgomery.

Alabama River downstream of Claiborne Lock and Dam and Lake

The following subsections describe the effects of the current operation and proposed plan on stream flow and water quality conditions as they relate to biological resources in the Alabama River downstream of Claiborne Lock and Dam and Lake. A minimum flow target of 6,600 cfs, is designated at that location. That flow collaterally supports navigational uses, but the minimum flow alone is not sufficient to maintain a viable navigation channel in the lower Alabama River downstream of Claiborne Lock and Dam, with or without maintenance dredging in that reach. Fish and aquatic resources inhabiting the Alabama River at Claiborne Lock and Dam and Lake, as well as downstream of the lock and dam, would experience no adverse effects.

Current operation

Average daily flows in the Alabama River downstream of Claiborne Lock and Dam and Lake over the 70-year modeled period of record are presented in Figure 6.1-9. Peak flows occur at just below 68,000 cfs at the end of March and rapidly decline, falling to a minimum of about 10,600 cfs in early September. The ability of Robert F. Henry Lock and Dam and Millers Ferry Lock and Dam to reregulate flows is limited and, thus, do not exert an effect on flows downstream of Claiborne Lock and Dam and Lake. The percent exceedance of flows levels ranges from approximately 800 cfs to 269,000 cfs (Figure 6.1-10). Under the current operation, the 6,600 cfs minimum flow target would be met 98 percent of the time over the period of record.

Water quality conditions are expected to improve under the current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. Overall, no adverse effects would be expected on fish and aquatic resources.

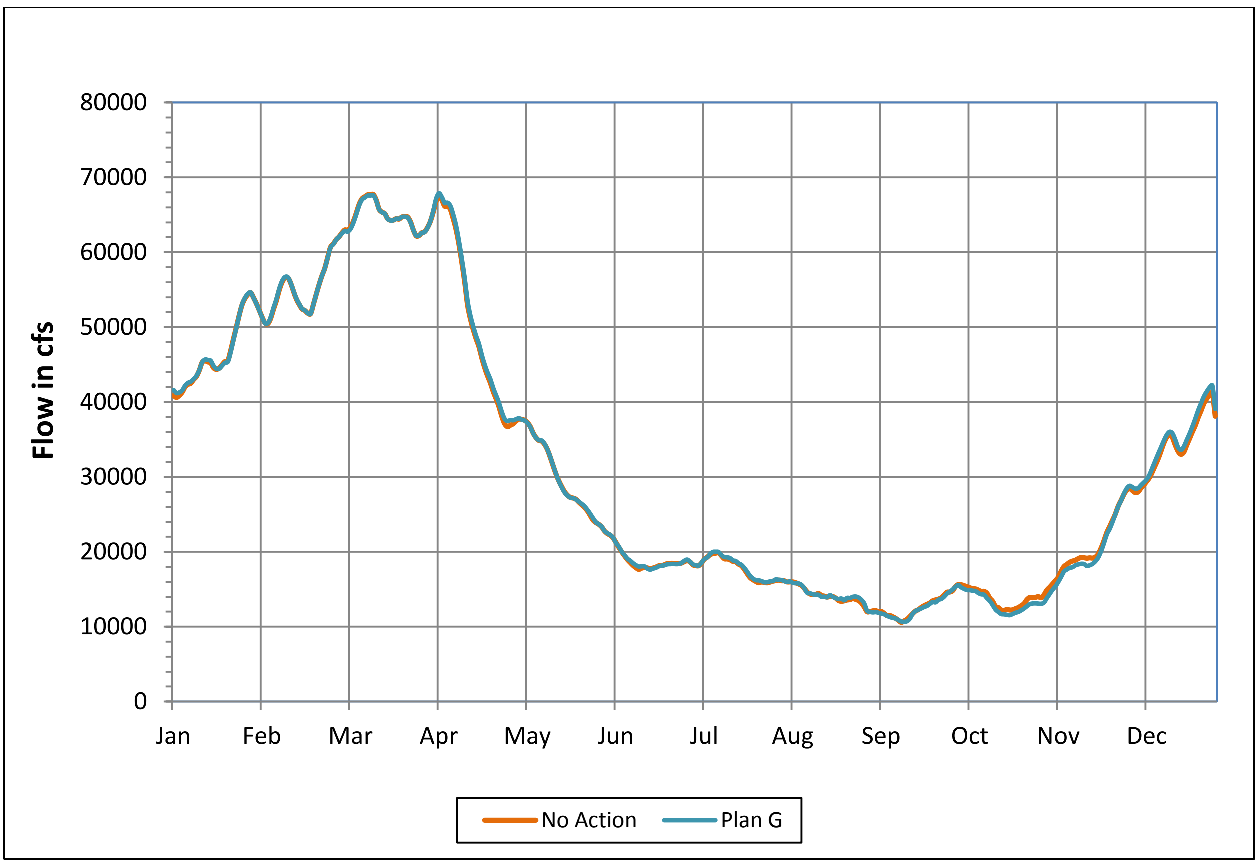

Figure 6.1-9. Claiborne Lock and Dam, average daily discharge (cfs) over the modeled period of record (1939–2008).

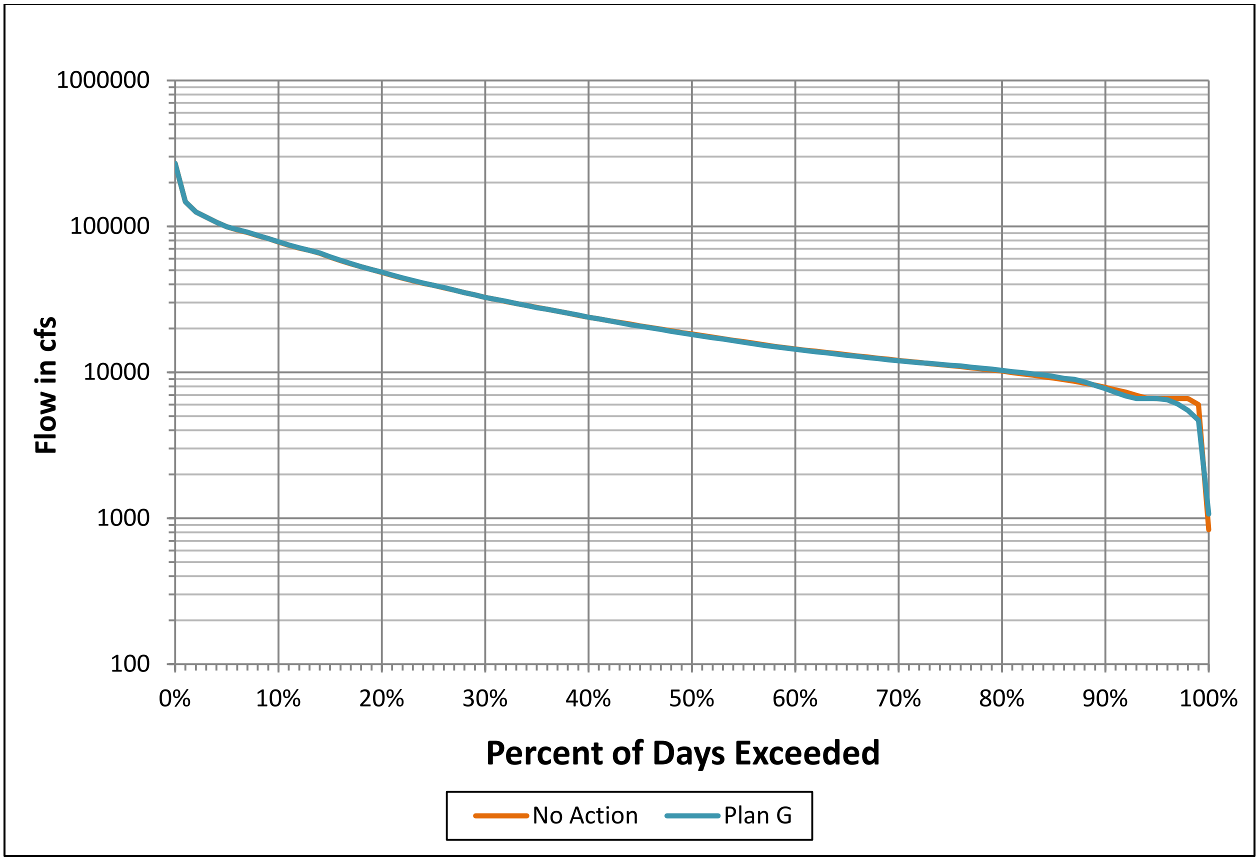

Figure 6.1-10. Downstream of Claiborne Lock and Dam, daily discharge (cfs)—percent of days exceeded over the modeled period of record (1939–2008).

Proposed Action

With respect to the current operation, the effects of operational features on flow and water quality conditions under the proposed action would result in adjustments designed to meet navigational needs when sufficient flows are available and would provide progressively more stringent drought management plans under dry conditions. Objectives would be at least partially met by with little change to overall flow characteristics downstream of Claiborne Lock and Dam and Lake. Under the proposed operation, the minimum flow target would be expected to be met 95 percent of the time.

Water temperatures under low-flow conditions would be expected to increase by approximately 1.8 °F (1.0 °C) upstream of Robert F. Henry Lock and Dam (Figure 6.1-11 in response to flows decreasing by 2,500 cfs. However, temperatures would stabilize downstream and show little change downstream of Claiborne Lock and Dam and Lake. Median DO concentrations would be expected to show an inverse response, decreasing approximately 1.0 mg/L upstream of Robert F. Henry Lock and Dam and with little difference from No Action Alternative values downstream of Claiborne Lock and Dam and Lake.
With respect to the current operation, the effects of operational features on flow and water quality conditions under the proposed action would not be expected to affect fish and aquatic resources on the Alabama River at Claiborne Lock and Dam and Lake and on the lower Alabama River downstream of the lock and dam.

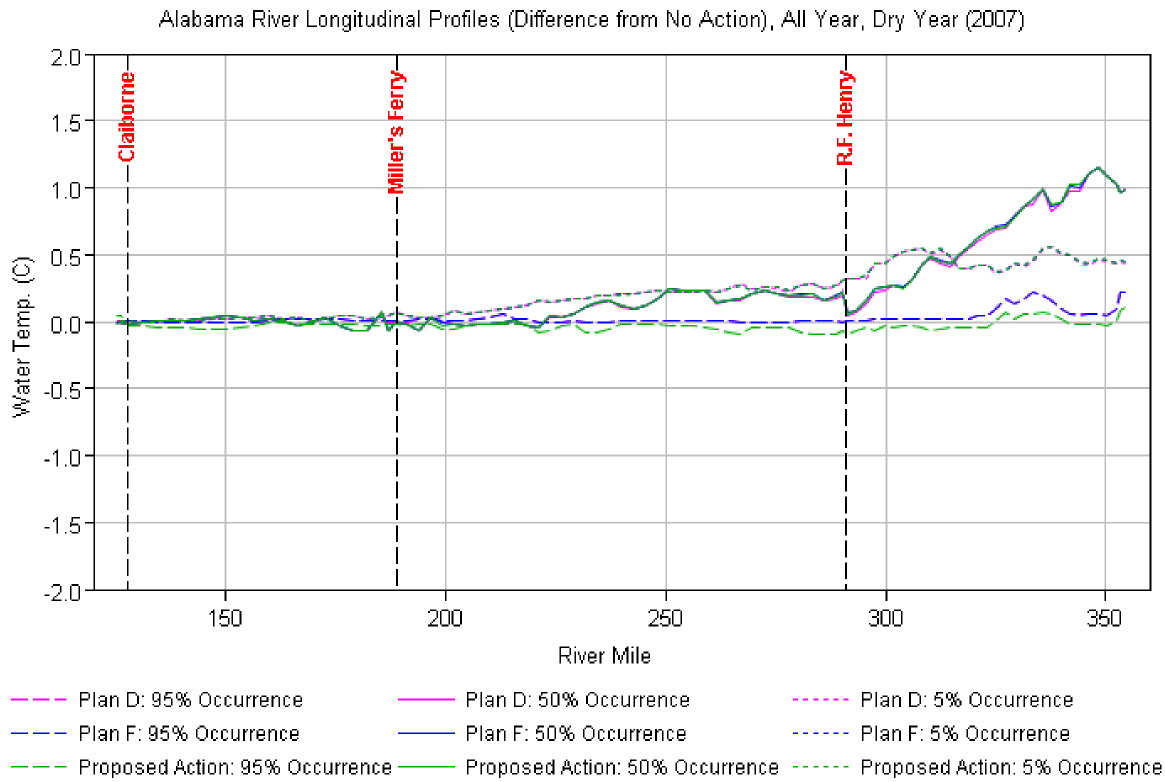

Figure 6.1-11. Alabama River water temperature longitudinal profile for a representative dry-weather year (2007).

Reservoirs

This section describes the general effects on reservoir fisheries and other aquatic resources associated with operational changes to reservoir management in the ACT Basin. The proposed changes would most notably affect lake levels in the upper portion of the basin, particularly at Allatoona Lake. Thus, a detailed assessment of modeled surface water elevation data at Allatoona Lake was conducted. The assessment uses a performance measure developed by USFWS and is based on work products of the Comprehensive Study (USACE, Mobile District 1998a) to characterize the potential effect of the alternative flow scenarios on habitat suitability of select recreationally important species. The lack of any substantive change in habitat in response to the operational alternatives at Allatoona Lake confirms the exclusion of further analyses of downstream reservoirs, where modeled water quantity and water quality data suggest that changes would be minimal.

Operational flow changes affect habitat for reservoir fisheries and other aquatic resources mainly through changes in water levels, changes in reservoir flushing rates (retention times), and associated changes in water quality parameters, such as primary productivity, nutrient loading, DO concentrations, and vertical stratification. Seasonal water level fluctuations can substantially influence littoral (shallow-water) habitats, decreasing woody debris deposition, restricting access to backwaters and wetlands, and limiting seed banks and stable water levels necessary for native aquatic vegetation (Miranda 2008).Those limitations, in turn, significantly influence the reproductive success of resident fish populations. High water levels inundating shoreline vegetation during spawning periods frequently have been associated with enhanced reproductive success and strong year class development for largemouth bass, spotted bass, bluegill, crappie, and other littoral species (Ploskey and Reinert 1995; Ryder et al. 1995). Conversely, low or declining water levels can adversely affect reproductive success by reducing the area of available littoral spawning and rearing habitats.

In a study of 11 Alabama reservoirs, which included 6 reservoirs in the ACT Basin, Maceina and Stimpert (1998) found consistent relations between the production of strong crappie year classes and wet winters before crappie spawning. Wet winters resulted in shorter retention time (i.e., higher flushing rates) in reservoirs with stable water levels, and higher water levels in fluctuating reservoirs. High winter inflows might favor crappie production by increasing nutrient loading, which in turn stimulates primary and secondary production later in the growing season (Maceina and Stimpert 1998; Ploskey and Reinert 1995). In reservoirs with stable water levels and low retention, longer post-winter retention also was associated with greater crappie production, possibly related to reduced flushing of young-of-year fish in the discharge from the impoundment and more stable feeding conditions (Maceina and Stimpert 1998).

Fish passage is provided at Claiborne Lock and Dam and Millers Ferry Lock and Dam through the manipulation of lock schedules during February through May to benefit migratory fish. Monitoring the effectiveness of those operations and determining the species using the locks is part of an ongoing collaborative study between The Nature Conservancy, Auburn University, ADCNR, USFWS, and others. The continued operation of the locks for the purposes of providing passage is anticipated to remain unchanged and, thus, will not be affected under the No Action or Proposed Action Alternatives.

Allatoona Lake

Performance measures developed by USFWS during the Comprehensive Study were used in the evaluation of surface water elevations at Allatoona Lake. The performance measures assess reservoir fisheries habitat on the basis of the premise that greater departure of reservoir levels from optimum levels for critical guilds of fishes (e.g., littoral spawning, rearing) results in greater effects on their habitats. The performance measure uses modeled output of daily reservoir elevations over the 70-year period of record and *acceptability levels* of reservoir elevations (i.e., suitability criteria) for critical guilds as identified for each reservoir by regional fisheries experts in an iterative questionnaire survey developed by Ryder et al. (1995). The performance measure also incorporates day-to-day reservoir level stability over critical spawning and rearing periods as a weighting factor, with stable or rising levels having a positive effect and falling levels having a negative effect on fish habitat. Performance measure scores were computed for each year in the period of record at Allatoona Lake. Scores range between 0 for least acceptable and 1.0 for most acceptable reservoir level habitat conditions (USACE, Mobile District 1998a). A graphical example for Allatoona Lake is given in Figure 6.1-12.

Median performance measure values (50th percentile) of all modeled alternatives in Allatoona Lake were low (0.23 to 0.25), indicating a lack of suitable fisheries habitat (Table 6.1-3). However, the range of values over the period of record shows little change among the operational alternatives. The subtle differences in performance measures can be attributed to operational changes of the fall drawdown and are most notable between the current operation and proposed action during the rearing and summer habitat critical periods. Acceptability levels track closely during the spawning period, showing a slight divergence in late May (Figure 6.1-13). Values remain below 0.5 until the latter half of April, reaching suitable levels for spawning of recreationally important species, such as largemouth bass, spotted bass, and crappie. Similar rearing habitat values are maintained for both alternatives at levels below 0.4 throughout the critical period of June 1 to November 1, with the proposed action exhibiting a greater decline and falling below the current operation in response to drawdown levels during late September and October (Figure 6.1-14). Acceptability level scores of summer habitat follow a similar trajectory, falling below 0.2 by early August (Figure 6.1-15).

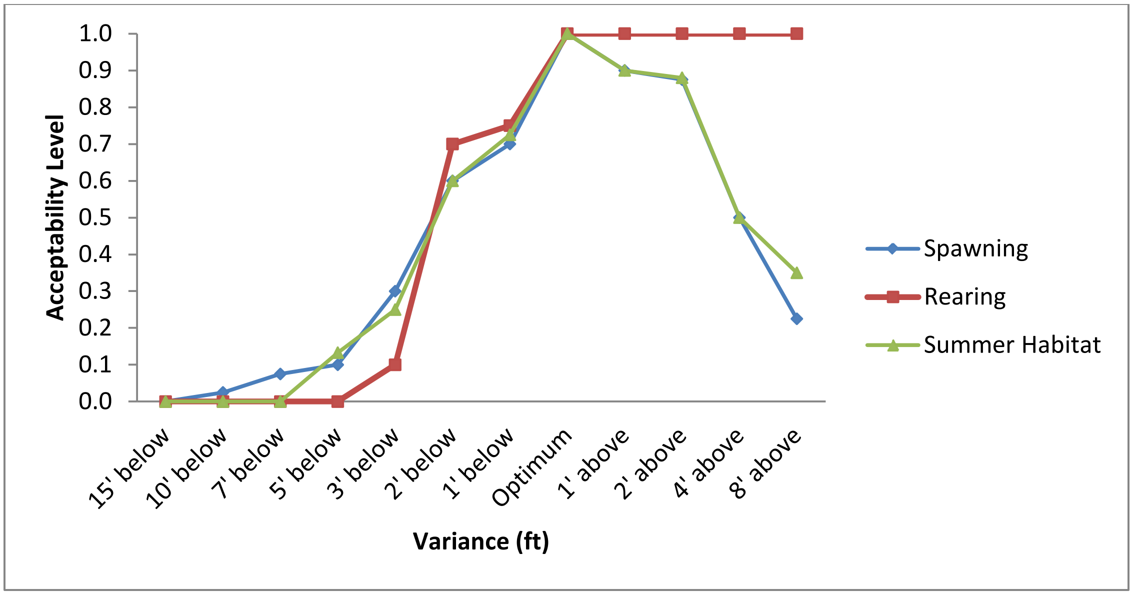

Figure 6.1-12. Example of acceptability scores for varying surface water elevations at Allatoona Lake.

Table 6.1-3.
Range of annual performance measure values of fisheries habitat at Allatoona Lake over the modeled period (1939–2008)

	Current Operation	Proposed Action Alternative
10th Percentile	0.09	0.09
25th Percentile	0.18	0.16
50th Percentile	0.25	0.24
75th Percentile	0.32	0.30
90th Percentile	0.38	0.37
Minimum	0.00	0.01
Maximum	0.54	0.51

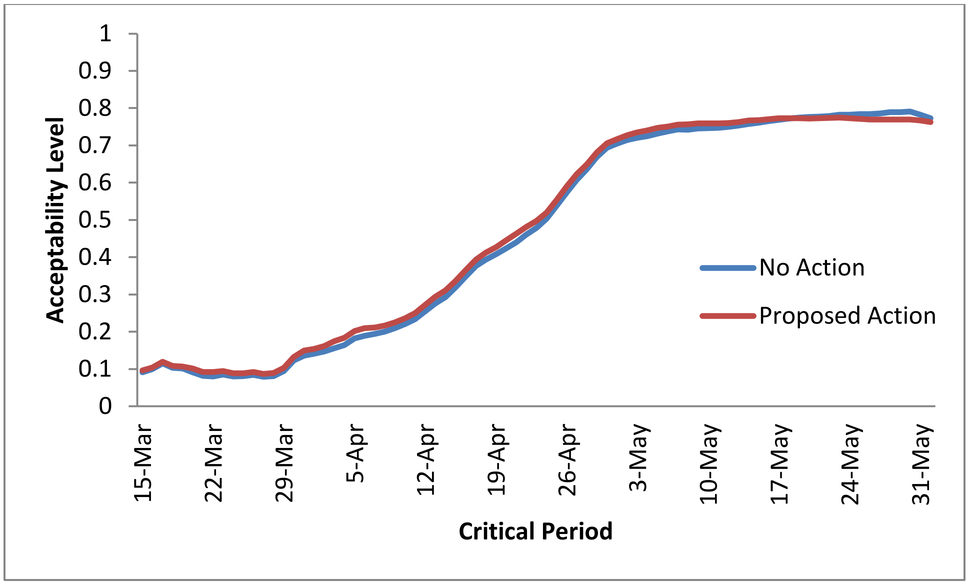

Figure 6.1-13. Daily spawning habitat acceptability level values of the current operation and the proposed action at Allatoona Lake over the modeled period (1939–2008).

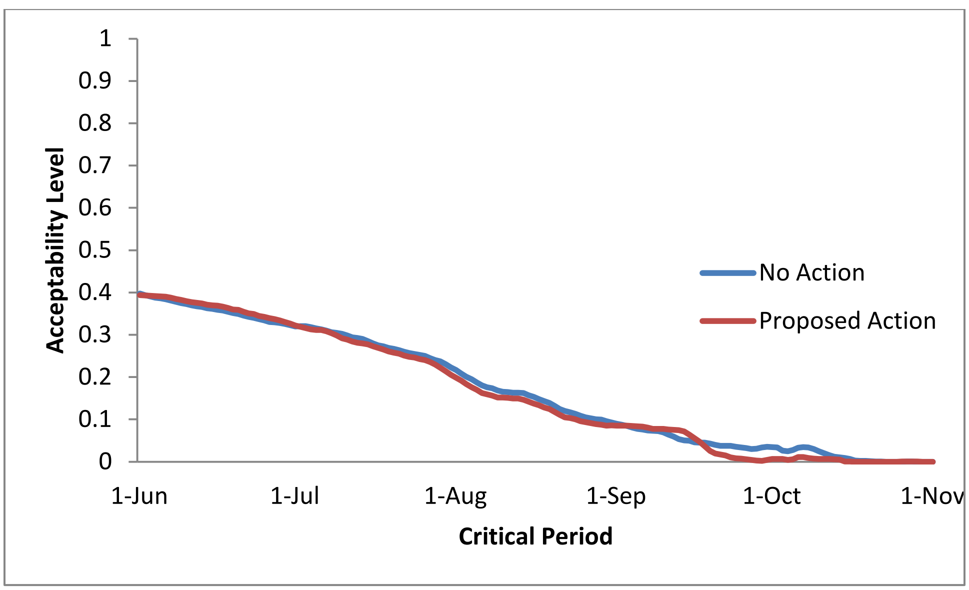

Figure 6.1-14. Daily rearing habitat acceptability level values of the current operation and the proposed action at Allatoona Lake over the modeled period (1939–2008).

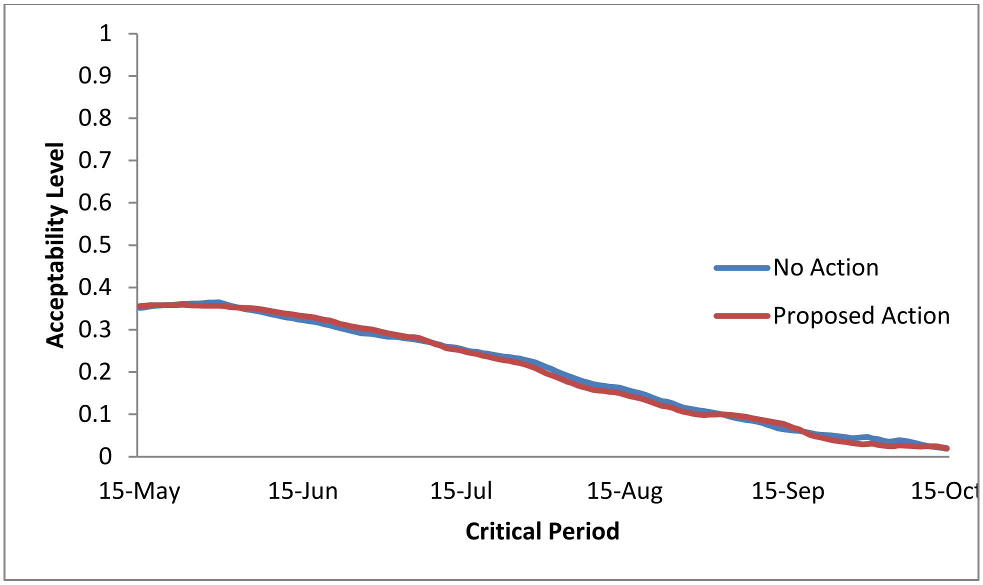

Figure 6.1-15. Daily summer habitat acceptability level values of the current operation and the proposed action at Allatoona Lake over the modeled period (1939–2008).

Current Operation

The current operation would maintain marginally higher performance measure values than the proposed action. The difference is attributable to proposed operational changes during the fall drawdown period and is most notable in rearing habitat acceptability level values in September and October. However, the differences would not result in any appreciable change in fish habitat among alternatives. Because operational changes would be most significant at Allatoona Lake, the lack of any notable change in fish habitat is applicable to other facilities in the ACT Basin, where the influence of the proposed modifications would be dampened. No adverse effects on fish or aquatic resources are expected.

Proposed Action

On the basis of modeled water surface elevations over the 70-year period of record, implementing the proposed plan would offer no significant change to fish habitat compared to the current operation. Operational changes would be most pronounced at Allatoona Lake. Thus, the lack of any notable change in fish habitat is applicable to other facilities in the ACT Basin, where the influence of the proposed modifications would be dampened. No adverse effects on fish or aquatic resources would be expected.

Estuaries

Estuaries exist at the junction between freshwater and salt water, and their function is integrally linked to freshwater inputs. Principal consequences of managing freshwater flow to estuaries are related to the magnitude and timing of flows (Mann and Lazier 1991). Freshwater flows are important in maintaining the delivery of material and energy critical to estuarine productivity and in providing habitat conditions conducive to maintaining the diversity and abundance of the estuarine community.

Oyster fisheries can be threatened by both drought and flood, and there is evidence of beneficial and detrimental effects of each (Livingston 1991; Wilber 1992; Livingston et al. 2000; Turner 2006; Wang et al. 2008; Buzan et al. 2009). Flow management can exacerbate those conditions, although it is also possible that it decreases flood magnitudes (through peak suppression and decreased drought severity through required releases) thereby mitigating some of the effects. However, flow management operations could result in more frequent and longer-duration periods of low flow if flows are retained upstream for required uses, forcing downstream management of a lower flow scenario than would be natural. Extended periods of low flow increase estuarine salinity. Some authors suggest that increased salinities threaten oyster fisheries (e.g., Livingston et al. 2000), whereas others indicate the opposite might be true (e.g., Turner 2006). More explicit hydrodynamic models of oyster population processes indicate more dramatic effects on oyster growth at lower salinities (higher flow) than under increased salinities, where growth rates are stable (Wang et al. 2008). Salinity and, therefore, freshwater discharge are important to oyster production. Many other factors, however, also affect oyster production. Little evidence suggests that the proposed operational changes, as opposed to drought or those other factors, would have a detrimental effect on oyster productivity in Mobile Bay.

Current Operation

As discussed earlier, flows modeled over the 70-year period of record in the Alabama River downstream of Claiborne Lock and Dam and Lake peak at just below 68,000 cfs at the end of March, declining to a minimum of approximately 10,600 cfs in early September. Under the current operation, the established 6,600 cfs minimum flow requirement would be met 98 percent of the time over the period of record.

Water quality conditions are expected to improve under the current operation as states adhere to defined regulations regarding wasteload allocation and managing NPDES facilities and nonpoint sources. There would be no adverse effects on fish or aquatic resources.

Proposed Action

Changes in flow characteristics and water quality as far downstream as the Mobile Bay estuary would be expected to be minimal or non-detectable for the proposed action. Both flow magnitude and timing would be expected to be similar for wet, dry, and normal years. Thus, with respect to the current operation, the flow management operations for flow and water quality conditions would not be expected to affect fish or aquatic resources in Mobile Bay under the proposed action.

Protected Species

Reservoir operations can influence two types of direct or indirect actions that could affect the habitats of federal- and state-protected species listed in Table 6.1-4.

- Alteration of flow regimes in reservoirs and downstream of dams
- Water quality degradation

The agencies implementing or regulating such actions would be responsible for determining the project-specific effects on protected species, because the effects would depend on where and how the actions occur. The following discussion guides assessment efforts when agencies are facing those choices.

Alteration of Flow Regimes in Reservoirs and Downstream of Dams

Little information is available on the linkages between flow regime characteristics and the life histories of protected species occurring in the basin. While this is beyond the scope of the current effort, it might be possible to quantify optimal flow regimes for some of or all the riverine-dependent species, or even minimum flow regimes that would ensure each species' survival and persistence in the basin. Such an effort would show that some species do best in wet years and others do best in dry years. However, overall biological diversity and ecosystem function benefit from inter-annual variations in species success (Tilman et al. 1994). Previous efforts at riverine ecosystem restoration have demonstrated that it is not possible to simultaneously optimize conditions for all species (Sparks 1992, 1995; Toth 1995). Therefore, the best strategy for protecting the ecology and biodiversity of the basin, including its protected species, is to maintain or restore to some extent the natural patterns of variability of flow regimes throughout the basin.

Water Quality Degradation

Riverine communities generally require clean water with sufficiently high dissolved oxygen concentration and appropriate temperatures. Although water quality has improved in the ACT Basin since the 1970s because of controls on point source pollutant discharges under the CWA, water quality problems related largely to nonpoint source sedimentation and other contaminants continue in many river reaches. Biological conditions in the ACT Basin are most severely degraded in the urbanized reaches of the basin (Frick et al. 1998). Water quality degradation is a frequently cited concern for the riverine-dependent species included in the *Comprehensive Study's Protected Species Report* (Ziewitz et al. 1997). It is quite likely that water quality is a limiting factor for several of the species, including many of the 16 federally listed mussels listed in Table 6.1-4. Any actions that could alter water quality must address effects on the protected species.

Table 6.1-4.
Federally protected species potentially affected by water allocation in the ACT Basin

State	Common name	Scientific name	Endemic	Federal	AL	GA	Sub basin	Habitat
	Mammals							
AL	Alabama beach mouse	*Peromyscus p. ammobates*		E	SP		MB	Scrub dunes of the coastal strand community
AL	Perdido Key beach mouse	*P. p. trissyllepsis*		E	SP		MB	Scrub dunes of the coastal strand community
AL	West Indian manatee	*Trichechus manatus*		E	SP	E	MB	Open estuarine
	Birds							
AL/GA	Wood stork	*Mycteria americana*		E	SP	E	UCO, LCO, T, AL	Forested wetland/shallow water
	Fish							
AL	Gulf sturgeon	*Acipenser oxyrinchus desotoi*		T	SP		AL	Riverine mainstem
AL	Pygmy sculpin	*Cottus paulus*	Y	T	SP		LCO	Riverine/tributary, coldwater spring (only)
AL/GA	Blue shiner	*Cyprinella caerulea*	Y	T	SP	E	LCO, UCO	Riverine/mainstream/large tributary/rocky
GA	Etowah darter	*Etheostoma etowahae*	Y	E		E	UCO	Riverine/mainstream/ tributary/riffle
GA	Cherokee darter	*E. scotti*	Y	T		T	UCO	Riverine/tributary small-medium streams
AL	Cahaba shiner	*Notropis cahabae*	Y	E	SP		AL	Riverine/mainstream/pool/ clear waters
GA	Amber darter	*Percina antesella*	Y	E		E	UCO	Riverine/mainstream/large tributary/riffle
AL/GA	Goldline darter	*P.aurolineata*	Y	T	SP	T	UCO, AL	Riverine/mainstream/riffles and runs
GA	Conasauga logperch	*P. jenkinsi*	Y	E		E	UCO	Riverine/mainstream/riffles and runs
AL	Alabama sturgeon	*Scaphirhynchus suttkusi*	Y	E	SP		AL	Riverine/mainstream/large tributary/sand and gravel substrates
	Insects							
AL	Mitchell's satyr butterfly	*Neonympha m. mitchellii*		E	SP			
	Mollusks							
AL/GA	Upland combshell	*Epioblasma metastriata*		E	SP	E	UCO, AL	Riverine, stable gravel or sandy gravel substrates
AL/GA	Southern acornshell	*E. othcaloogensis*	Y	E	SP	E	LCO, AL, UCO	Riverine/rock and gravel substrates
AL	Southern combshell	*E. penita*		E	SP		AL	Riverine, stable gravel or sandy gravel substrates
AL	Orangenacre mucket	*Lampsilis perovalis*		E	SP		AL	Riverine, stable gravel or sandy gravel substrates
AL/GA	Finelined pocketbook	*L. altilis*		T	SP	T	AL, LCO, UCO, T	Riverine, stable gravel or sandy gravel substrates
AL	Alabama pearlshell	*Margaritifera marrianae*		C			AL	Riverine/stable or sandy gravel substrate

Table 6.1-4. (continued)

State	Common name	Scientific name	Endemic	Federal	AL	GA	Sub basin	Habitat
	Mollusks (continued)							
AL/GA	Alabama moccasinshell	*Medionidus acutissimus*		T	SP	T	UCO	Riverine/rivers and large creeks
AL/GA	Coosa moccasinshell	*Medionidus parvulus*		E	SP	E	UCO	Riverine, stable gravel or sandy gravel substrates
GA	Painted clubshell	*Pleurobema chattanoogaense*		C		E	UCO	Riverine/medium size rivers/stable gravel or sandy gravel substrate
AL/GA	Southern clubshell	*P. decisum*		E	SP	E	AL, T	Riverine/medium size rivers/stable substrate
AL/GA	Southern pigtoe	*P. georgianum*	Y	E	SP	E	UCO, LCO	Riverine, stable gravel or sandy gravel substrates
GA	Georgia pigtoe	*P. hanleyanum*	Y	E*		E	UCO	Riverine/medium size rivers/stable gravel or sandy gravel substrate
AL/GA	Ovate clubshell	*P. perovatum*		T	SP	E	T	Riverine, stable gravel or sandy gravel substrates
AL	Heavy pigtoe	*P. taitianum*		E	SP		AL	Riverine/stable grave or sandy gravel substrates
	Inflated heelsplitter	*Potomilus inflatus*		T	SP		AL, LCO, UCO, T	Riverine/stable grave or sandy gravel substrates
AL/GA	Triangular kidneyshell	*Ptychobranchus greenii*		E	SP	E	UCO, AL, LCO	Riverine/high quality riffle-run
	Snails							
AL	Lacy elimia	*Elimia crenatella*	Y	T	SP		LCO	Riverine/mainstream/ tributary riffle
AL	Round rocksnail	*Leptoxis ampla*	Y	C	SP		AL	Riverine/mainstream/ tributary riffle
GA	Georgia rocksnail	*L. downei*		E*		E	UCO	Riverine/mainstream/ tributary riffle
GA	Interrupted rocksnail	*L. foremani*		E*		E	LCO, UCO	Riverine/mainstream/ tributary riffle
AL	Plicate rocksnail	*L. plicata*		T	SP			Riverine/mainstream/ tributary riffle
AL	Painted rocksnail	*L. taeniata*	Y	C	SP		LCO	Riverine/mainstream/ tributary riffle
AL	Flat pebblesnail	*Lepyrium showalteri*	Y	E	SP		AL	Riverine/mainstream/ tributary riffle
AL/GA	Cylindrical lioplax snail	*Lioplax cyclostomaformis*	Y	E	SP		AL	Riverine/mainstream/ tributary riffle
AL	Tulotoma snail	*Tulotoma magnifica*	Y	E	SP		AL, LCO	Riverine/mainstream/ tributary riffle
	Plants							
AL	Price's potato bean	*Apios priceana*		T			AL	Mesic soils in open areas along creeks
AL/GA	Georgia rockcress	*Arabis georgiana*		C		T	UCO	Dry, shallow soils on rocky bluffs & sandy loam soils on eroding river banks
AL/GA	Alabama leather flower	*Clematis socialis*		E		E	UCO	Mesic flats along intermittent creeks

Table 6.1-4. (continued)

State	Common name	Scientific name	Endemic	Federal	AL	GA	Sub basin	Habitat
	Plants (continued)							
AL	Whorled sunflower	*Helianthus verticillatus*		E			UCO	Relict praries, moist prarie-like openings along creeks
AL/GA	Mohr's Barbara's buttons	*Marshallia mohrii*		T		T	LCO, UCO	Palustrine/emergent/open water
AL/GA	White fringeless orchid	*Platanthera integrilabia*		C		T	T, UCO	Boggy areas at stream heads and seepage slopes
AL	Harperella	*Ptilimnium nodosum*		E			LCO, UCO	Palustrine/riverine
GA	Michaux's Sumac	*Rhus michauxii*		E		E	UCO	Sandy or rocky open woods on acidic soils
AL/GA	Kral's water-plantain	*Sagittaria secundifolia*		T			UCO	Riverine/tributary/riffle/run/pool
AL/GA	Green pitcher-plant	*Sarracenia oreophila*		E		E	LCO, T, UCO	Palustrine/forested, bogs, streambanks
AL	AL canebrake pitcher plant	*Sarracenia rubra alabamensis*	Y	E			LCO, T	Palustrine, sandhills, seeps, bogs, and swamps
AL/GA	Georgia aster	*Symphyotrichum georgianum*		C		T	UCO	Post oak-savanna communities and relict praries
AL/GA	TN yellow-eyed grass	*Xyris tennesseensis*		E		E	LCO, UCO	Palustrine; margins in and along spring runs and wet meadows
	Reptiles and Amphibians							
AL	Reticul. flatwoods salamander	*Ambystoma bishopi*		T	SP		AL	Open-canopied, flatwoods & savannas dominated by longleaf pine
AL/GA	Loggerhead sea turtle	*Caretta caretta*		T	SP	E	MB	Open estuarine
AL/GA	Green sea turtle	*Chelonia mydas*		T	SP	T	MB	Open estuarine
AL	Eastern indigo snake	*Drymarchon corais couperi*		T	SP	T	AL	Flatwoods, tropical hammocks, dry glades and moist bogs
AL	Kemp's ridley sea turtle	*Lepidochelys kempii*		E	SP	E	MB	Open estuarine
AL	Red hills salamander	*Phaeognathus hubrichti*		E	SP		AL	Steep sloped ravines and bluffs dominated by hardwoods
AL	Black pine snake	*Pituophis melanoleucus lodingi*		C	SP		AL	Xeric, fire-maintained longleaf pine forest
AL	Alabama red-belly turtle	*Pseudemys alabamensis*		E	SP		AL	Rivering/mainstream/palustrine/open estuarine/sub and intertidal

Notes:
E = listed as endangered; C = candidate species for listing; T = listed as threatened; SC = federal species of special concern; SP = species formally protected; R = rare, no legal status; Y = species is endemic to basin; s/a = protected because of similar appearance to the listed species; CO = Coosa; LCO = Lower Coosa; UCO = Upper Coosa; AL = Alabama; T = Tallapoosa; MB = Mobile Bay.

Coosawattee River downstream of Carters Reregulation Dam

The following subsections describe the effects of the current operation and proposed action on protected species in the Coosawattee River downstream of Carters Reregulation Dam. Modeled output of stream flow and water quality over the period of record were evaluated to with respect to the distribution of federally listed species and designated critical habitat units within the subbasin. As previously stated, dedicated studies to address the impacts of the proposed operational changes on protected species not are available and are beyond the scope of this effort.

This segment of the ACT Basin is inhabited by several federally listed species of freshwater mussels, fish and a single snail species (see Table 6.1-4). Critical habitat has been designated for mussels, including the southern acornshell, ovate clubshell, southern clubshell, upland combshell, triangular kidneyshell, Alabama moccasinshell, Coosa moccasinshell, southern pigtoe and fine-lined pocketbook (Figure 6.1-16). The federally threatened goldline darter and federally endangered interrupted rocksnail also exist along this reach.

Current Operation

USFWS has recommended seasonal minimum flow targets ranging from 240 cfs to 865 cfs. Under the current operation, March and December targets (selected as examples to represent seasonality and months during which USFWS recommended minimum flows are higher than the current 240 cfs requirement) are already met approximately 87 and 81 percent of the time, respectively, under current operations. Water quality conditions are expected to improve for the current operation, as states adhere to defined regulations regarding wasteload allocation, management of NPDES facilities and non-point sources. Conditions under this alternative are consistent with current conditions and thus the current operation is not expected to affect protected species on the Coosawattee River downstream of Carters Reregulation Dam.

Proposed Action Alternative

HEC-ResSim model results indicate that the addition of the seasonally variable minimum flow targets would not yield significant changes in the mean daily flows over the period of record. However, notable improvements are realized during low flow events. Flows at the minimum levels of 240 cfs occur approximately 4 percent of the time under the proposed action, compared to 9 percent for the current operation. Changes in water quality, with respect to temperature and dissolved oxygen values, would be expected to be minor for the proposed action. Thus, with respect to the current operation, the effects of operational features on flow and water quality conditions presented under the proposed action would be expected to have no adverse effects on protected species of the Coosawattee River downstream of Carters Reregulation Dam.

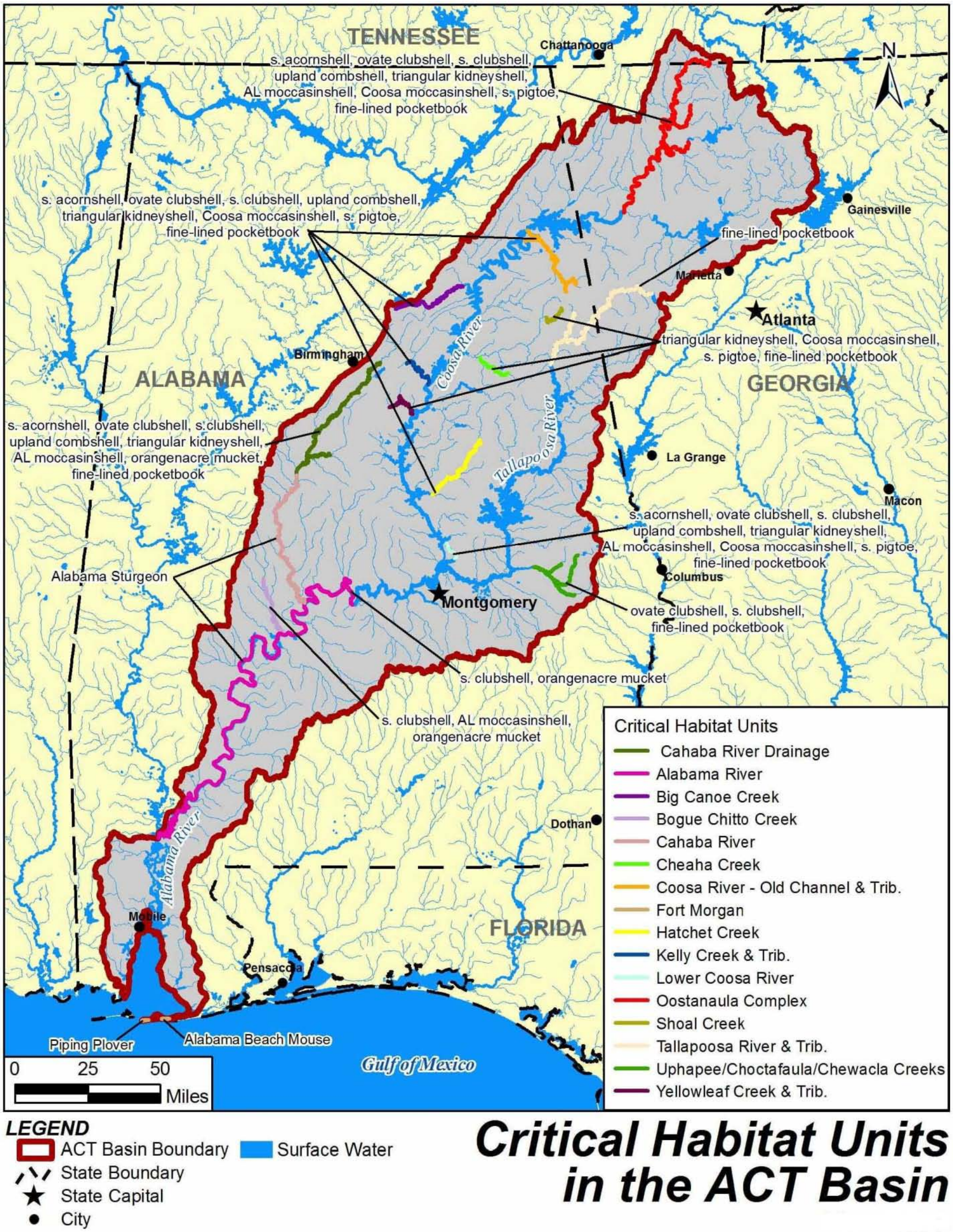

Figure 6.1-16. Critical Habitat Units in the ACT Basin.

Etowah River downstream of Allatoona Lake

The following subsections describe the effects of the current operation and proposed action on protected species in the Etowah River downstream of Allatoona Lake. Modeled output of stream flow and water quality over the period of record were evaluated to with respect to the distribution of federally listed species and designated critical habitat units within the subbasin. As previously stated, dedicated studies to address the impacts of the proposed operational changes on protected species are not available and are beyond the scope of this effort.

Federally listed species in the Etowah River downstream of Allatoona Lake includes eight freshwater mussel species, three fish species and two snail species. Critical habitat has not been established along this reach (Figure 6.1-16). With exception to two mussel species and one fish species, which are federally threatened, all are currently listed as endangered.

Current Operation

Flow conditions over the modeled period are expected to remain consistent with current conditions and water quality is expected to improve as States adhere to defined regulations regarding wasteload allocation, management of NPDES facilities and non-point sources. Thus, the current operation is not expected to affect protected species on the Etowah River downstream of Allatoona Lake.

Proposed Action

The proposed operation proposes a revision of the number and reshaping of the action zones to temper full peaking hydropower releases during dry conditions. It also implements a phased guide curve and reduction of hydropower generation during the fall drawdown period, shifting the timing of releases between September and December. However, the overall effect of these actions is negligible as increased flows during December should offset lower releases earlier in the phased drawdown period. Changes in water temperature and dissolved oxygen are minor.

Compared with the current operation, the effects of operational features on flow and water quality conditions presented under the proposed operation would not be expected to affect protected species on the Etowah River downstream of Allatoona Lake.

Coosa River at Rome, Georgia

The following subsections describe the effects of the current operation and proposed action on protected species in the Coosa River at Rome, Georgia. Modeled output of stream flow and water quality over the period of record were evaluated to with respect to the distribution of federally listed species and designated critical habitat units within the subbasin. As previously stated, dedicated studies to address the impacts of the proposed operational changes on protected species are not available and are beyond the scope of this effort.

Federally listed species in the Coosa River at Rome includes eleven freshwater mussel species, two fish species and two snail species. Critical habitat has not been established along this reach (Figure 6.1-16). All species are federally endangered, except two species of mussels which are federally threatened.

Current Operation

Flow conditions over the modeled period are expected to remain consistent with current conditions and water quality is expected to improve as states adhere to defined regulations regarding wasteload allocation, management of NPDES facilities and non-point sources. Thus, the current operation is not expected to affect protected species on the Coosa River at Rome.

Proposed Action

Operational changes under the proposed operation, particularly the reduction in hydropower generation at Allatoona Lake during fall drawdown, would be expected to shift the timing of releases from September through December. However, model runs suggest that these changes will not significantly affect flow characteristics in the Coosa River at Rome compared to the current operation and will have negligible effects on water quality. Thus, the proposed action is not expected to affect protected species on the Coosa River at Rome.

Alabama River at Montgomery, Alabama

The following subsections describe the effects of the current operation and proposed action on protected species in the Alabama River at Montgomery, Alabama. Modeled output of stream flow and water quality over the period of record were evaluated with respect to the distribution of federally listed species and designated critical habitat units within the subbasin. As previously stated, dedicated studies to address the impacts of the proposed operational changes on protected species are not available and are beyond the scope of this effort.

This segment of the ACT Basin is inhabited by several federally listed species, including three species of freshwater mussels (inflated heelsplitter, heavy pigtoe and southern clubshell), one fish species (Alabama sturgeon) and a single snail species (tulotoma snail). Critical habitat has been designated for the Alabama sturgeon (Figure 6.1-16). The impact of the proposed operational changes on the availability of sturgeon habitat cannot be determined because flow requirements for the species are poorly understood.

Current Operation

Over the modeled period of record, the current opertion meets the 4,640 cfs minimum flow target 99 percent of the time. Water quality conditions are expected to improve as states adhere to defined regulations regarding wasteload allocation, management of NPDES facilities and non-point sources. These features offer no substantial change to current conditions, thus the current operation is not expected to affect protected species on the Alabama River downstream of Montgomery.

Proposed Action

The proposed action would result in adjustments to meet navigational needs when sufficient flows are available, but also provides drought management plans under dry conditions which become progressively more stringent as condition worsen. However, because reservoirs above the Alabama River at Montgomery function more like run-of-river operations, water quality parameters would not be expected to change in response to the proposed action. The minimum flow target under the proposed plan is expected to be met 96 percent of the time and the influence on water temperature and dissolved oxygen is minor.

Compared to the current operation, the effects of operational features on flow and water quality conditions presented under the proposed action are not expected to affect protected species on the Alabama River downstream of Montgomery.

Alabama River downstream of Claiborne Lock and Dam and Lake

The following subsections describe the effects of the current operation and proposed action on protected species in the Alabama River downstream of Claiborne Lock and Dam and Lake. Modeled output of stream flow and water quality over the period of record (1939 – 2008) were evaluated to with respect to the distribution of federally listed species and designated critical habitat units within the subbasin. As previously stated, dedicated studies to address the impacts of the proposed operational changes on protected species are not available and are beyond the scope of this effort.

Federally listed species in the Alabama River downstream of Claiborne Lock and Dam and Lake include the inflated heelsplitter and heavy pigtoe (mussels), Alabama sturgeon (fish) and tulotoma snail. Critical habitat for Alabama sturgeon extends down to Mobile Bay (Figure 6.1-16). However, flow requirements for the species are poorly understood, thus inhibiting the ability to determine the effects of the proposed operational features on Alabama sturgeon habitat.

Current Operation

Over the modeled period of record, the current operation meets the 6,600 cfs minimum flow target 98 percent of the time. Water quality conditions are expected to improve as States adhere to defined regulations regarding wasteload allocation, management of NPDES facilities and non-point sources. These features offer no substantial change to current condition, thus the current operation is not expected to affect protected species on the Alabama River at Claiborne Lock and Dam and Lake and on the lower Alabama River downstream of the lock and dam.

Proposed Action

Implementation of the proposed operation will result in adjustments to meet navigational needs when sufficient flows are available, but also provides drought management plans under dry conditions which become progressively more stringent as conditions worsen. However, under this alternative, the minimum flow target is expected to be met 95 percent of the time and the influence on water temperature and dissolved oxygen is minor.

With respect to the current operation, the effects of operational features on flow and water quality conditions presented under the proposed operation would not be expected to affect protected species on the Alabama River at Claiborne Lock and Dam and Lake and on the lower Alabama River downstream of the lock and dam.

DEPARTMENT OF THE ARMY
MOBILE DISTRICT, CORPS OF ENGINEERS
P.O. BOX 2288
MOBILE, ALABAMA 36628-0001

FEB 08 2013

REPLY TO
ATTENTION OF:

Inland Environment Team
Planning and Environmental Division

Mr. William Pearson
Field Supervisor
U.S. Fish and Wildlife Service
1208-B Main Street
Daphne, Alabama 36526

Dear Mr. Pearson:

The enclosed document is in response to your December 21, 2012, Draft Fish and Wildlife Coordination Report (DFWCAR) for the proposed Water Control Manual (WCM) updates for the Alabama-Coosa-Tallapoosa (ACT) River Basin. The DFWCAR identified many conservation measures that the Service recommends be implemented in the WCM update. Because our proposed action did not include those measures, you recommended that we consider additional alternatives that would include them. As we indicate in our response, our action is limited to updating our water management guidelines for managing the storage and release of water from Corps reservoirs in the ACT Basin and two reservoirs owned by the Alabama Power Company over which we have flood risk management responsibility. Therefore, most of the conservation measures you identified are outside the scope of the current project. Others, as we explain in the response, are potentially within scope, but cannot be practicably implemented or would severely impact authorized project purposes. We believe the proposed action represents an approach that balances all project purposes and would provide improvements for the aquatic environment, especially during drought conditions. We appreciate and agree with your statement that you fully support the proposed drought response plan.

We also agree that continued coordination is needed between our agencies. I and my staff stand ready to meet with you to discuss the DFWCAR and the recommended conservation measures, or other issues of concern at your convenience. Thank you for providing the DFWCAR and your assistance thus far in WCM update process. Should you have any questions, please contact Mr. Chuck Sumner at (251) 694-3857 or lewis.c.sumner@usace.army.mil.

Sincerely,

Steven J. Roemhildt, P.E.
Colonel, Corps of Engineers
Commanding

Enclosures

Response to U.S. Fish and Wildlife Service Draft Fish and Wildlife Coordination Act Report on Water Control Manual Updates for the Alabama-Coosa-Tallapoosa River Basin in Georgia and Alabama

Prepared by:

U.S. Army Corps of Engineers
MOBILE DISTRICT

February 2013

INTRODUCTION

On December 21, 2012, the U.S. Fish and Wildlife Service (Service), Georgia Ecological Services Office, Daphne, Alabama provided a copy of the *Draft Fish and Wildlife Coordination Act Report on Water Control Manual Updates for the Alabama-Coosa-Tallapoosa River Basin in Alabama and Georgia* (DFWCAR) to the U.S. Army Corps of Engineers (Corps), Mobile District. Following is a detailed response to the questions and comments outlined in the DFWCAR under the auspices of the Fish and Wildlife Coordination Act and the Endangered Species Act.

This response is generally organized in the format of the DFWCAR, answering concerns and comments in the order they were presented. The DFWCAR stated that the draft report had been coordinated with the Alabama Department of Conservation and Natural Resources, the Alabama Office of Water Resources (OWR), the Georgia Department of Natural Resources and the National Oceanic Atmospheric Administration. Of those agencies, only OWR provided comments; however the DFWCAR did not include those comments or provide any related discussion. Likewise, at this time we will provide no discussion of the OWR comments. All page number citations refer to the page number as indicated in the DFWCAR.

COVER LETTER

Pg. 2 – *The Service states "Because of the limited scope of the WCM update, the proposed alternative does not fully address many of the Service's conservation concerns in the basin".* The Corps agrees that many of those concerns are not addressed; however, those concerns are generally not issues that can be directly related to the current project scope. The current effort is expressly restricted to updating the Corps' Master Water Control Manual (WCM) and appendices for the ACT basin. Those manuals provide guidance to Corps staff on the day-to-day management of water resources at Corps projects within the basin and Alabama Power Company projects over which the Corps has flood management responsibilities. Therefore, the manuals do not address stakeholder concerns that are not impacted or related to proposed changes in water management decisions.

EXECUTIVE SUMMARY

Pg 4. – *The Service states "Carters Lake would provide a minimum flow of 240 cfs and refined operations that would include two action zones to manage downstream releases. When Carters Lake is in Zone 1 Carters Reregulation Dam minimum flow releases would be equal to the seasonal minimum flow based on mean monthly flow upstream of Carters Lake and storage for water supply for the City of Chatsworth would be 818 ac-ft."* While this description is essentially correct, we wish to add a clarification. As described in our Planning Aid Letter Response dated June 3, 2011, the minimum flow of 240 cfs would only apply when the pool level is in Zone 2. As noted in Figure 1-2.3, page 12 of that response, the seasonal minimum flows in Zone 1 would actually be significantly greater than 240 cfs. In fact, for eight months of each year the minimum flows would be equal to or greater than 400 cfs and during the January through May time period minimum flows would exceed 600 cfs, in Zone 1.

Pg 4. – *The Service states "If sufficient flows cannot support a navigation channel of 7.5 ft, navigation would be suspended and flows at Montgomery would be reduced to 4,640 cfs or* *lower if one or more of the drought operation triggers would be exceeded.*" This is a true statement; however, we would like to clarify that "sufficient flows" to support navigation would be determined by the ACT Basin Drought Plan. In that plan, flows for navigation (at least 4,640 cfs at Montgomery AL) would be provided as long as the Alabama Power Company Drought Operation Plan were in Drought Intensity Level 0 (Normal Operations), meaning that no drought triggers had been met. Also, we would like to emphasize that the Corps cannot "suspend" navigation. Vessel operators would continue to make determinations if there were sufficient water depth for navigation based on all available information, including flow and stage data.

Pg 5. – *The Service states "The Service does not fully support the Corps' Proposed Action Alternative as currently described nor the Corps' No Action Alternative. Because of the limited scope of the WCM update, the proposed alternative cannot fully address many of the Service's conservation concerns in the basin. Our position is due to the lack of improvement to water quality, lack of support for reintroduction and enhancements for listed species, minimal mimicking of components of the natural flow regime, no reduction of effects of hydropower peaking flows, and no recognition that fish passage at ACT dams is within the scope of the current effort"* The Corps believes that this comment demonstrates the Service's seeming misunderstanding of the scope of the Proposed Action Alternative (PAA); this misunderstanding creates most of our concerns with the DFWCAR. The action which the Corps is proposing is intended to describe a plan for operation of the Corps' reservoirs for water management at the reservoirs and water releases from those projects that balances all authorized project purposes, of which fish and wildlife resources is one. This action is limited to updating the existing WCM and appendices. For example, reintroduction of endangered species would require actions not related to the update of the WCM. These and other actions listed by the Service are either outside the scope of the project or not physically possible within the context of the WCM update as we will describe in response to individual comments within the body of the DFWCAR. The update of the WCM does not include installation or modification of any equipment or structures, studies or analyses or other indirectly related actions or initiatives not directly supporting the update. Some of the Service's recommendations would go well beyond the original intent of the project, adding components that would require additional funding and authorizations.

INTRODUCTION

FISH AND WILDLIFE CONCERNS AND PLANNING OBJECTIVES

Pg. 9 – *The Service states "The PAL (Service 2010) regarding the ACT WCM Updates stated the primary concerns and planning objectives for species and ecosystem integrity in the ACT.*" Also, "*Planning objectives to improve the quality of the ACT focus on instream flow, water quality, habitat protection, and fish passage. Enhancements in these areas should be a priority in future Corps operations.*" The Corps agrees with the general concept of making a priority in its planning objectives of instream flow, water quality, habitat protection, fish passage and other aspects of environmental stewardship. However, the Service's comment does not provide specific enhancements that could be incorporated into the WCM update. For example, as previously discussed in the responses to the PAL and in this document, a plan to provide a monthly minimum flow at Carters Lake has been proposed. Such a plan has not been proposed at Allatoona Lake because of a combination of physical limitations of the equipment and the requirement to meet hydropower production, an authorized project purpose. We would welcome and be willing to discuss with the Service specific recommendations, given current authorizations and funding.

DESCRIPTION OF THE CORPS' SELECTED PLAN

Pg. 12 – *The Service states "Carters Lake would provide a minimum flow of 240 cfs."* As noted above, this would occur only in Zone 2. In Zone 1 (non-drought conditions), there would actually be a seasonal monthly minimum flow of much greater than 240 for most months.

FISH AND WILDLIFE RESOURCES WITHOUT THE PROJECT

Pg. 13 – *The Service provides a bulleted list of impacts attributed to the current operation including higher base flows due to channel maintenance, loss of habitat and species assemblages, alteration of the natural flow regime, risk of decreased freshwater flows into the Alabama Delta and Mobile Bay, reduced floodplain connectivity, poor water quality such as low dissolved oxygen, altered temperatures, and wastewater concentrations, hampered organism passage, and fragmentation of aquatic populations.* The Corps does not disagree that the stated impacts have occurred, but we do disagree that they can be attributed solely to water management decisions, whether under the current operation or those being considered in the WCM update. For example, channel maintenance is a Corps-managed Federal activity that could, and sometimes does occur independently of water management activities, evidenced by those years when no channel maintenance has occurred on the ACT. Likewise, wastewater concentrations are not affected by water management decisions, and aquatic populations are not fragmented by water management decisions.

Instead, we believe that most of the impacts listed by the Service can be attributed to a combination of Corps (Federal) and non-Federal activities that are not part of this WCM update. These include the physical construction of dams and associated reservoirs on the rivers, urban development throughout the basin and its associated demands for water supply, placement of industries that discharge wastewater into the rivers and increased runoff from urban, agriculture and silvicultural sources.

We agree that at specific locations, primarily in relatively limited reaches below Corps dams, Corps water management decisions impact base flows and other aspects of the natural flow regime, floodplain connectivity, and water quality parameters such as dissolved oxygen and water temperature. We emphasize that Corps projects were designed and constructed, and continue to be operated in order to alter natural flows and decrease floodplain connectivity in order to achieve congressionally authorized project purposes of providing hydropower and reduce flooding, as well as fish and wildlife resources and others.

CORPS' ANALYSIS OF PROJECT IMPACTS AND EVALUATION METHODOLOGY

1. Flow Dynamics

<u>1.1 Conservation and Recovery of Natural Flow Variability</u>

Pg. 13 – *The Service discusses the Corps' proposed monthly minimum flows at Carters Lake and the Corps' previously stated position that a seasonal non-hydropower peaking operation at Allatoona Lake would be impractical. The Service states in the same paragraph "The other reservoirs in the ACT Basin were not addressed."* The only reservoirs in the basin that the Corps has capacity to alter downstream hydrology are at those two projects. The Corps emphasizes that other reservoirs in the basin are either run-of-river or owned and operated by Alabama Power Company (APC). For those operated by the Corps (R.F. Henry, Millers Ferry, and Claiborne projects) there is no significant storage capacity in those reservoirs and for the most part pass whatever water enters the reservoir. Therefore, releases depend almost entirely on inflows which in turn are determined by releases from upstream storage projects operated by APC or local inflows. As for the APC projects, they are owned and operated by that company and the Corps has no authority over their water management other than that for navigation and flood control purposes at specific projects.

Pg. 14 – *The Service states: "The planning activities and construction for new reservoirs in the ACT were not addressed in the PAL response. The following reservoirs are in various planning and construction stages and their impacts to the watershed should be considered: 1) Hickory Log Creek Reservoir, 2) Russell Creek Reservoir, 3) Richland Creek Reservoir, 4) Shoal Creek Reservoir, 5) Calhoun Creek Reservoir."* Project specific impacts of those non-Corps reservoirs will be appropriately evaluated through the Corps Regulatory permitting authority, which for Georgia is under the jurisdiction of Savannah District. Of those listed by the Service, only Hickory Log Creek Reservoir is beyond the planning stage (constructed). The future operation and withdrawals from those proposed reservoirs is not known. While the Corps is considering requests by the owners of Hickory Log Creek related to releases from it into the Etowah River and the Cobb County Marietta Water Authority's water storage contract, no final decision has been made and therefore the impacts cannot be predicted at this time. However, it is agreed that the potential for continued construction of water supply reservoirs in the basin should be addressed to the extent possible in the EIS as part of the cumulative impacts evaluation.

EVALUATION OF THE PROPOSED ACTION ALTERNATIVE

1. Flow Dynamics

1.1 Conservation and Recovery of Natural Flow Variability

Pg. 19 – *The Service states: "The Corps is proposing nearly no changes that would mimic components of the natural flow regime. An exception is the zones given in the Proposed Action Alternative for Carters Lake, which may have beneficial impacts to the flow regime in the downstream Coosawattee River. It is important to maintain flow in the ACT during all hydrologic conditions. When a drought is identified a minimum flow must remain to ensure biota are able to survive. Proposed minimum flow releases that equal a mean monthly 7Q10 inflow upstream of Carters Lake would create requirements simulating a more natural flow regime when Carters Lake is in Zone 1, an improvement to the current annual 7Q10 minimum flow of 240 cfs. The 7Q10 low flow statistic is calculated using the smallest values of mean discharge over 7consecutive days during a set time period, such as monthly or annually, with a 10-year recurrence interval. The release of a mean monthly 7Q10 flow is not proposed for the other dams in the ACT Basin. This concept would aid in creating a more natural flow environment at those facilities in which a static annual 7Q10 flow has been applied in the past."* The Service's statement is essentially correct. However, it must be pointed out that Carters Lake has a unique feature in the re-regulation pool which allows varying monthly releases for 7Q10 minimum flows. That feature is not present at the other facilities. Lake Allatoona is designed as a hydropower peaking facility and would require extended periods not producing any hydropower to provide anything approaching a natural flow regime. On the Alabama River, the three Corps projects (R.F. Henry, Millers Ferry and Claiborne) are all run-of-river and for the most part pass whatever water they receive from upstream. This fact makes these three projects entirely dependent on upstream hydrology and releases by APC projects over which the Corps has no control.

Pg. 19 – *The Service states the concern that potential private development of hydropower facilities at Claiborne Lock and Dam would have potential impact on fish and wildlife resources and they encourage the Corps to include them in future conversations if the proposal moves forward.* The Corps agrees with the request for inclusion in conversations; however the referenced private development at Claiborne is outside the scope of the WCM update project and is not a comment relevant to the WCM update. The Service should also refer to the Federal Energy Regulatory Commission (FERC) licensing process and comment opportunities.

Pg. 19-20 – *The Service states: "At all the projects in the ACT Basin we recommend the Corps restore parameters of a natural flow regime by reducing hydropeaking releases, allowing large floods to reach floodplains, and mimicking the natural hydrograph as much as possible by allowing for seasonal fluctuations in river discharge."* As previously stated, the comment would only be applicable to the Allatoona project and reducing hydropower releases would mean shutting down hydropower generation since the equipment does not allow for partial flow. Allowing large downstream flooding would likely involve greatly increased flood damages especially in the City of Rome GA. Both hydropower generation and flood control are important Congressionally-authorized project purposes. The Corps attempts to balance all authorized project purposes; however, making significant reductions in hydropower and flood control, as the Service recommends, would run contrary to the original authorizing legislation for Carters and/or Allatoona projects. The other Corps projects are located on the Alabama River and are run-of-river. Consequently, those projects mimic peaking releases from upstream APC projects and there is no capacity to redistribute the flows to match a natural hydrograph.

Pg. 20 – *The Service discusses the environmental benefits of free-flowing and natural flow conditions and states that restoration of a natural flow regime will improve water quality and physical habitat. Using Claiborne as an example it states: "For example, ensuring adequate flow is released from Claiborne Dam is important to maintain proper freshwater inflows to the Tensaw delta and Mobile Bay. Other examples such as inundation of Claiborne Dams, opening locks for organism passage, and reduction of large peaking events for hydropower can aid in restoration of free-flowing habitats. We recommend taking steps towards restoring a more natural flow regime throughout the ACT Basin."* In general, the comment on establishing natural flows has been previously addressed in this document. No specific recommendations were made that could be incorporated into the WCM. Because Claiborne and the other Alabama River projects are run-of-river, there is very little storage and releases are dependent on upstream inflow. Claiborne Dam has a fixed-crest spillway at elevation 33 feet above mean sea level (msl) and is not a hydropower facility. The gated spillway crest is at elevation 15 feet msl. Normally, water is maintained between 33 to 35 feet msl. At 35 feet and above, spillway gates are opened to lower the pool level. Therefore, the normal condition is water passing over the fixed-crest spillway continuously. The exception to that is during times of extreme low flows when there is not enough inflow to reach the fixed-crest spillway. In that case, an attempt is made to maintain the pool elevation at 32 feet msl and all inflows are passed using the spillway gates. Use of locks for fish and other organism passage are included in the WCM update language. Regarding hydropower peaking projects, reduction of hydropower peaking at projects having that capacity would be counter to a major authorized project purpose.

2. Water Quality

Pg. 20 – *The Service states: "Alabama and Georgia's 303(d) lists include waterbodies that occur in the ACT Basin. These waterbodies are in need of attention and consideration in the WCM updates and future operations of the Corps. Water quality issues include nutrient loads, metal contaminants, pathogens, organic enrichment, and siltation. We recommend measures to improve the quality of streams and river segments throughout the ACT Basin, with special consideration for 303(d) listed streams and reservoirs."* Under the Clean Water Act, the States or the Environmental Protection Agency are responsible for creating Total Maximum Daily Loads to address 303(d) listed reaches. While the Corps does consider water quality in its operations, this comment goes far beyond the scope of the WCM update and anything the Corps is capable of doing through water management actions.

2.1 Dissolved Oxygen

Pg. 20 – *The Service notes that the PAA would result in decreases in dissolved oxygen (DO) at several locations and increases at other locations compared to the No Action Alternative (NAA). Because of the modeled decreases, the Service states that the PAA is less favorable than the NAA. The Service goes on to state that the DO decreases were modeled to be lowest in dry years due to drought operations.* The Corps does not understand the rationale behind the statement. The Service states on page 29 in its Summary and Position that it fully supports the Alabama Drought Response Operations Plan (ADROP). In fact, the Service collaborated in providing final input into the plan. The Corps believes that the increases in DO at several locations balance the decreases at other locations and the overall benefits gained from the ADROP more than make up for the minor DO declines that were modeled. In addition, the modeled dry years are extreme and rare events that are not representative of basin-wide conditions during normal years.

Pg. 20, 21, 22 – *The Service discusses the need for DO and water temperature sampling at several industrial sites on the Alabama River and the need to maintain suitable flows for dissolved oxygen and temperature maintenance through cooperation between the Corps and APC.* The Alabama River industrial sites are not owned by the Corps. It is recognized that flow is an important factor in maintaining DO and temperature; however the Alabama River projects are run of river and entirely dependent on upstream flows provided by APC and others. The development of a basin-wide drought plan (ADROP) is precisely the type of cooperation being called for by the Service, but is not recognized in this comment.

Pg. 21 – *The Service states: "Although there was no noticeable change among the alternatives for the percent occurrence of DO levels at the modeled outflows in the ACT Basin, the analyses that were provided demonstrate the ongoing unacceptable levels of low DO caused by some of these Corps facilities."* Also: *"Due to the recurring problem of low DO below dams, methods have been developed to improve oxygen levels at other locations. For example, Tennessee Valley Authority (TVA) has installed dam-specific devices to improve DO downstream of dams.*

Examples include aerating turbines, surface-water pumps, low-pressure air blowers, aerating weirs, and oxygen injection systems. These types of systems should be examined as ways to improve water quality below Corps dams in the ACT Basin. We recommend the Corps take action to improve DO throughout the basin with special consideration below dams and to explore devices that can increase DO levels." The Service recognizes that there would be no change caused by PAA but focuses on known existing and ongoing low DO especially at Lake Allatoona. The Corps also recognizes the need for improved downstream DO. However, as part of a water management strategy that could be written into an operational manual, nothing has been identified that would improve DO. The methods and equipment listed by the Service cannot be implemented through water management decisions and are beyond the scope of the manual update.

2.2 Water Temperature

Pg. 22 – *The Service states that the largest differences between the PAA and the NAA would occur during drought operations with temperatures under the PAA decreasing below Carters Dam and Allatoona Dam by as much as 0.8-1.3 degrees C (Coosawattee and Etowah Rivers). It was noted that the artificial depression and fluctuations in temperatures are not beneficial to native aquatic populations below Allatoona Dam. However, it was also noted that a population of striped bass (Morone saxatilis) utilizes the cooler water as a thermal refuge. The Service stated that in Alabama water temperatures would rise by as much as 1.0-1.2 degrees C. It was recommended that water temperatures below Corps' facilities in Alabama be maintained at least below the State standard and below 30 degrees C when possible.* Water temperature decreases (compared to existing conditions) below Allatoona Dam of generally less than 1 degree Centigrade were modeled based on a dry year (2007, a severe drought) (See page 39-40 PAL response letter). While we understand potential problems experienced by warm water organisms, we believe the statement does not consider typically higher than normal air temperatures during a drought and potential benefits of lower water temperatures during low flows when lower DO levels also occur. Nor does it consider that organisms currently in those waters are adapted to cooler water temperatures and would be unlikely to be impacted by infrequent decreases of 1 degree. The statement does not consider previous statements made by the Service whereby it recommended increased minimum flows be provided. Because of the stratified condition of Lake Allatoona during the summer, increased minimum flows would more than likely come as result of hydropower generation, thereby producing even greater quantities of colder water than that of the PAA. In fact, during drought conditions with pool levels below the Allatoona spillway gates, the only method available to release water is through hydropower generation or sluice gates, both of which draw water from deeper, colder strata.

Pg. 22 – *The Service recommends cooperation between the Corps and others to maintain wastewater discharges that do not damage aquatic resources.* The Corps has no authority over wastewater discharges. The States have regulatory authority over those discharges through the National Pollutant Discharge Elimination System. The Corps currently coordinates closely with downstream dischargers during droughts to exchange information regarding releases and flows from Corps reservoirs. However, there is no procedure that could be written into the WCM that would ensure that discharges would not exceed specified limits.

Pg. 22-23 – *The Service comments on the sediment transport as influenced by the size and number of dams on the ACT system. They recommend that measures be taken to reduce sediment and shoaling and include bank stabilization above dams, avoidance of structural disturbance to rivers, and minimization of disturbance to river banks. They recommend monitoring embeddedness and erosion rates downstream of dams to determine impact on available habitat and implement stabilization measures to reduce further erosion.* The impacts due to tailwater degradation and shoaling are due to the original construction of Corps and APC projects and are not due to the PAA, as noted by the Service comment. Rates of tailwater degredation, shoaling and sedimentation are similar for both the NAA and the PAA. It is outside the scope of the WCM update to implement studies or monitoring.

3. Floodplain Connectivity

Pg. 23-24 – The Service provides a discussion of floodplain values and states: "The Corps provided high flow analyses for the NAA and the PAA at several locations in Georgia. The alternatives are similar, with the exception of the Etowah River below Lake Allatoona. The Corps did not provide flow guidelines to compare these alternatives to a pre-dam condition; therefore we are unable to draw a conclusion as to which alternative is more similar to pre-dam conditions in the Etowah River." The Corps provided a June 6, 2011response to the PAL letter and a November 22, 2011response to additional questions from the Service. In those responses, the Corps provided an analysis consistent with Service guidance. An analysis of Indicators of Hydrologic Alteration (IHA) was provided at three locations on the Etowah and Oostanaula Rivers providing high and low flow analyses. The Allatoona and Carters projects are authorized and operated specifically to reduce flooding below the upstream projects. It is acknowledged that these projects reduce flooding. Restoring floodplain connectivity downstream of Carters and Allatoona would likely mean flooding the City of Rome Georgia. Alabama River projects are run of river and do not reduce flooding.

4. Fish Passage

Pg. 24-26 – *The Service recommends that the Corps continue to support fish passage research and frequently open locks during the spring migration period. The Service also states "We request a cost benefit analysis be performed comparing the operation and maintenance of the current navigational channel and system of locks and dams on the Alabama River versus the costs and economic benefits associated with maintaining the same system for maximum environmental benefits.* The Corps plans to continue to work cooperatively with all agencies to use the locks to benefit fish passage. This plan is described as part of the current and proposed operations. An economic study of the costs and benefits of operating the navigation system for navigation versus environmental benefit is beyond the scope of the current WCM update.

5. Reintroductions and Enhancements for Listed Species

Pg. 26 – *The Service encourages the Corps to work with them to achieve the goals of the Alabama Aquatic Biodiversity Center's plan for reintroduction of listed and rare species into the ACT system as well as improving habitat for those species.* The Corps agrees with the goal of reintroducing species and enhancing habitat through collaboration; however, such work is not within the scope of the current WCM update.

Pg. 27 – *The Service recommends that the Corps protect locations of sensitive and listed species and make efforts to increase fish passage. The Service also recommends that efforts be made to improve the health of the rivers and provide support for ongoing studies.* The Corps currently plans to continue to work cooperatively to use locks to benefit fish passage as previous stated. Protection of species locations is outside the scope of the WCM update. The recommendation to improve the health of the rivers and provide support for studies is vague and does not relate directly to the update of the WCM.

Pg. 27 – *The Service recommends that the Corps protect all landholdings where species of concern occur.* This is not part of the WCM update process and outside of scope. However, Corps landholdings are generally protected by the fact of Federal ownership. Proposed activities on those properties require appropriate NEPA documentation and where appropriate, consultation with the Service regarding listed threatened and endangered species and their habitat. *The Service recommends a number of studies be undertaken. These include water quality monitoring, species surveys, habitat restoration and monitoring.* A number of studies to support the preparation of the WCM have been completed and the results provided to the Service. Those include hydrologic modeling, water quality modeling and threatened and endangered species surveys throughout the basin with Service oversight. Other studies mentioned and the need for long-term studies is understood; however such studies are outside the scope of the current project. The purpose of the WCM is to manage the water stored at Corps' reservoirs. There is no authorization or funding for many of the other "stewardship" type actions that have been requested.

6. Restoration and Maintenance of Healthy Water Quality Parameters

Pg. 28 – *The Service recommends that improvements to water quality at Lake Allatoona be made a priority and that studies be made to determine water quality requirements for species and the impacts to species from changes in operations.* This recommendation has been previously addressed in this document. Additional studies are beyond the scope of the current WCM update and would not be directly relevant to water management decisions, especially in light of there being little difference in water quality parameters between the NAA and the PAA.

7. Development of Adaptive Management Protocols

Pg. 28 – *The Service recommends that an Adaptive Management Protocol be developed with ongoing studies to fill data gaps that would allow better decision making in the future with regards to environmental and human needs. They recommend that studies be implemented to begin the protocols including water availability, forecasts of water needs for humans and the environment, and how those needs can be met.* The Corps agrees that adaptive management is a useful approach and in fact, is currently utilizing the concept to a large extent. The Corps uses inputs from a variety of sources in modeling hydrology and projected water availability (pool levels, flow rates). The Corps is cooperating with all stakeholders to the extent possible to assure that authorized project purposes are met. The update of the WCM will serve as a guide in this regard and the update is needed to address many of the needs outlined by the Service. For example, the existing WCM does not include the drought response plan that would be part of the PAA. That drought plan, which the Service states it fully supports, would allow a more flexible response to drought providing benefits to the environment, private industry, navigation and other stakeholder interests. Therefore, the Corps cannot agree that such studies and protocols be perfected prior to completion of the WCM. We continue to maintain that many such studies are outside the scope of the current effort. Instead, we will continue to collaborate with stakeholders to improve water management decisions to balance authorized purposes.

FISH AND WILDLIFE CONSERVATION MEASURES AND RECOMMENDATIONS

Pg. 29 – *The Service summarizes its position in a list of recommendations.* All of the listed recommendations have been addressed in the discussion above. *In addition, the list included a recommendation to develop Geographic Information Systems databases that identify and map riverine habitats.* As with other recommended studies, this is outside the scope of the WCM update.

The list included a recommendation for continued coordination between Corps and APC to ensure acceptable releases from upstream dams (Carters and Allatoona) for delivery to the Weiss Bypass channel. The Corps agrees that coordination is desirable. However, routing of water into the Weiss Bypass channel is under direct control by APC, not the Corps. In updating the WCM for Corps projects, there is no information available to the Corps or suggested by the Service as to how management decisions at Corps upstream projects could translate into directly improved water flow into the channel. Without such detailed information, it is not clear what changes, if any, are recommended to be made to the daily operation that could be described in the WCM.

The list also included a recommendation that the loss of aquatic resources as a result of the original construction of the Carters Lake Project be mitigated and that the impacts associated with project construction be included in the DEIS. Those impacts and recommended mitigation are not part of the current effort and outside the scope of the WCM update.

SUMMARY AND THE SERVICE'S POSITION

The Service states that "Neither the Corps' Proposed Action nor the No Action Alternative, because of the limited scope of the proposed updates will address all of the Services's conservation concerns in the ACT basin. These concerns include lack of improvement to water quality, lack of support for reintroduction and enhancements for listed species, minimal mimicking of components of the natural flow regime, no reduction of effects of hydropower peaking flows, and no recognition that fish passage at ACT dams is within the scope of the current effort. The statement justifying the position repeats the Services previous recommendations for analyses and actions that we believe are clearly outside the scope of the current effort as has been previously discussed. *The Service concludes by emphasizing the importance of data collection and implementation into long-term datasets in order to better evaluate the condition of the ACT basin over time. They also state the importance of developing research and monitoring efforts.* The need for long-term studies is understood; however they are outside the scope of the current project. The purpose of the WCM is to manage the water stored at Corps' reservoirs. There is no authorization or funding for many of the other stewardship type actions that have been recommended.

In summary, the Corps understands the recommendations made by the Service and contends that although they pertain to and would occur within the ACT basin, they are not part of the current effort to update the WCM. Achieving a natural hydrograph in its entirety is not the goal and is not feasible given the expansive flow alteration and consumptive demands in the ACT River Basin that have occurred since construction of the Federal and APC projects. To the extent that restoration of some of the natural flow regime components can be accomplished to the benefit of fish and wildlife resources in light of other project purposes, the Corps believes the PAA adequately strikes this balance. It is the responsibility of the Corps to best determine water management operations that meet all of the congressionally authorized project purposes. As described in the purpose and need section of the DEIS, the purpose and need for the federal action is to determine how the federal projects in the ACT Basin should be operated for their authorized purposes, in light of current conditions and applicable law, and to implement those operations through updated water control plans and manuals. The PAA is not intended to maximize benefits to fish and wildlife resources or any other authorized project purposes, but to equably manage the federal projects for the benefit of all authorized project purposes. Accordingly, the alternatives considered in the DEIS will not address any proposed changes to water management practices that exceed existing congressional authority. Although the Service does not support the PAA, we believe that there would be negligible impacts to fish and wildlife resources as a result of its implementation when compared to the current condition.