Working together to share a common resource.

Apalachicola-Chattahoochee-Flint Stakeholders

Sustainable Water Management Plan: **Water Management Alternatives Technical Memorandum**

JULY 9, 2013

BLACK & VEATCH
Building a world of difference.®

In association with

Georgia Tech Georgia Water Resources Institute

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.
May 13, 2015

Contents

INTRODUCTION AND PURPOSE 3
WATER MANAGEMENT ALTERNATIVES SUBMITTED 3
BUILDING A SHARED UNDERSTANDING 4
WATER MANAGEMENT ALTERNATIVES FOR ITERATIVE MODELING 8
OVERVIEW OF PROPOSED ROUND TWO Water Management Alternatives 12
Appendix A. WMA Summaries
Appendix B. Raw Survey Forms and Attachments
Appendix C. Blank Form

INTRODUCTION AND PURPOSE

Identifying and selecting water management alternatives (WMAs) to examine through modeling are critical steps in the development of the Sustainable Water Management Plan. This memorandum documents the ongoing process of gathering stakeholder input toward the development of WMAs and guides stakeholders toward the next priority of topics.

This memorandum has been updated several times since the first draft was provided to the Technical Oversight Committee Work Group (TOCWG) on May 18, 2012. All water management alternatives submitted as of May 10, 2013 are now documented in this memorandum. Additionally, this memorandum now includes proposed water management alternatives for the first round of modeling based on the approach discussed with the TOCWG in April 2013 and available time and funding resources. This document has been accepted for use in developing WMAs for the first round of modeling.

Currently the scheduled date for completing the first round of modeling and providing results is August 15, 2013. The date for completing the second round of modeling is mid to late-November 2013. The results of all modeling will be documented in the Sustainable Water Management Plan.

WATER MANAGEMENT ALTERNATIVES SUBMITTED

Black & Veatch developed a Water Management Alternative form to identify and collect potential water management alternatives from the ACFS members in May of 2012. The online submission process became operational in October of 2012 and the first form was completed online on November 1, 2012. A blank copy of the form is located in Appendix C.

Thirty-two completed forms were submitted with participation from all caucuses. Survey results for each caucus are summarized in Figure 1.

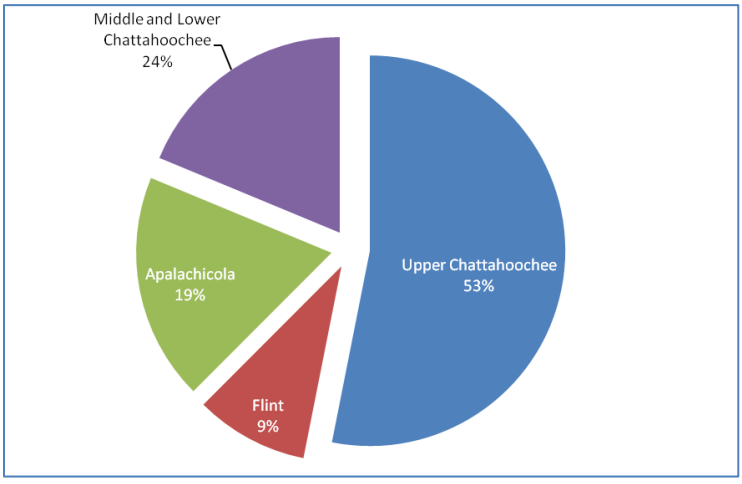
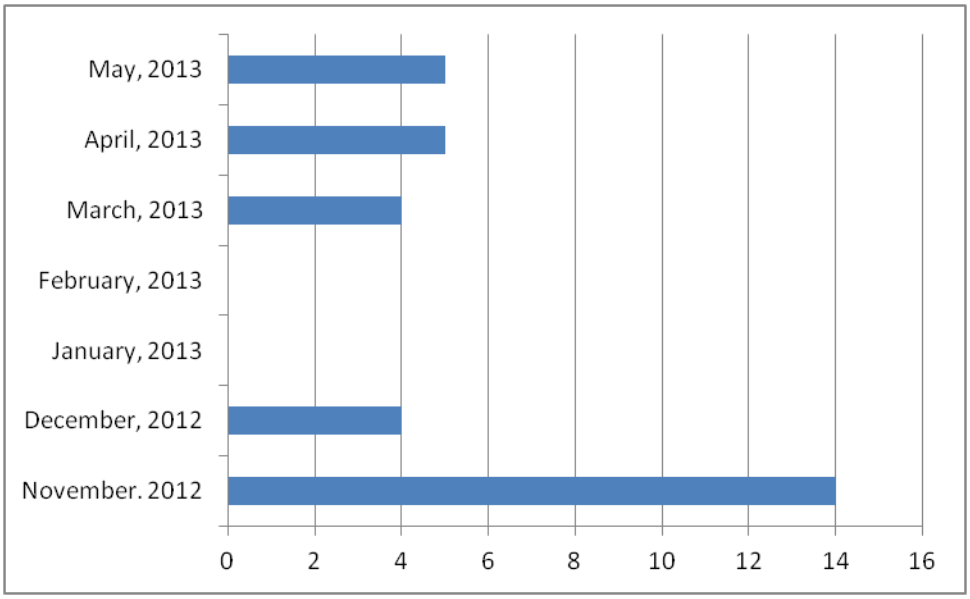


Figure 1 - Survey Results by Caucus

About half of the forms were submitted in November of last year as shown in Figure 2.

Figure 2- Number of Forms Submitted by Month



Water Management Alternatives were grouped into the following four foundational categories and summarized in Appendix A:

1. Changes in Water Use
2. Changes in Water Returns
3. Changes in Storage
4. Changes in Lake Operations

Some WMAs were also submitted in terms of their stated desired results (e.g. Optimized reservoir zone and RIOP curves with respect to individual as well as collective stakeholder interests (including reservoir zone and RIOP curves optimized for environmental flow conditions)). Individual completed survey forms with attachments are found in Appendix B.

BUILDING A SHARED UNDERSTANDING

Water management alternatives by their nature are intended to make improvements over current conditions. Thus, understanding the problems to be solved is important both in developing and in selecting the WMAs, and the learning process through iterative modeling about the extent to which WMAs achieve intended benefits without unacceptable tradeoffs will help shape future recommendations from the plan.

Stakeholder input on performance metrics by node and interests provides one foundational element in understanding the areas of concern where improvements are desired. These metrics can be found in the table summary in Appendix 1 of the Task 2 Memorandum. They will be used in the SWMP process to assess the extent to which proposed water management alternatives may result in improved conditions for stakeholders in the ACF Basin. Use of these metrics in assessing water management alternatives

does not mean stakeholders agree with each and all of the metrics proposed, but rather that the set of metrics taken together is sufficiently complete for this purpose.

The existing conditions model runs also shed light on where performance metrics currently are not being met and where, and on what the drivers of those effects are. The WMAs proposed for the two rounds of iterative modeling are intended to focus on as many of the problems identified by stakeholders and through the existing conditions analyses as possible given time and budget constraints. This approach is designed to be so that as full a range of opportunities and potential tradeoffs as possible can be seen early. This will provide the basis for stakeholders to engage in collaborative problem solving, think together about the impacts of proposed WMAs both positive and negative, and to inform the round two scenarios to preserve improvements and address adverse effects. Round two also will include more complex changes in dam operations.

Four progressive modeling scenarios were modeled for baseline comparison. The four progressive scenarios include the following:

1. **Unimpaired flows.** This scenario aims to characterize the system response under unimpaired flows, and without reservoirs, evaporation losses, or consumptive use.

2. **Reservoir construction without active management.** This scenario assumes that all main-stem reservoirs exist and are operated in run-of-river mode with storage kept constant at the mid-point of the conservation zone. No water demands are included in this scenario.

3. **Reservoir construction with current RIOP management.** This scenario is similar to the second scenario but with the reservoirs regulated according to the Revised Interim Operations plan currently in effect. No water demands are included.

4. **Existing conditions with current management, withdrawals, and returns**. This scenario is similar to the last scenario, but includes current consumptive uses as documented in the Task 4 Technical Memorandum.

These scenarios were used to assess the impacts of several factors:

- The impacts of evaporation were assessed by comparing Scenario 1 to Scenario 2.
- The impacts of dam operations (regulation) were assessed by comparing Scenario 1 to Scenario 3 without consumptive use.
- The impacts of consumptive use were assessed by comparing Scenario 3 to Scenario 4.

The results from these four model runs were reviewed in a TOCWG workshop on March 28, 2013 in Columbus, Georgia. The following observations were presented:

1) Lake Levels:

a) Effects of Consumptive Uses:

i) Consumptive uses decrease Lake Lanier levels by up to 1.5 feet, and West Point levels by up to 0.8 feet in comparison to RIOP operations without consumptive uses.

ii) Dry years exacerbate average level drawdowns especially at Lanier (of up to 2.5 feet) and West Point (of up to 1.5 feet).

2) Federal Reservoir Releases

a) Effects of Evaporation:

i) Evaporation decreases spring/summer/fall average monthly releases:

ii) Lanier up to 145 cfs (June; all years) and 177 cfs (June; dry years);

iii) West Point up to 250 cfs (June; all years) and 305 cfs (June; dry years);

iv) George 420 cfs (May/June; all years) and 520 cfs (June; dry years);

v) Woodruff 560 cfs (May; all years) and 690 cfs (May; dry years).

b) Effects of Regulation:

i) Regulated scenarios (i.e., RIOP) generally result in lower winter/spring and higher summer/fall releases than unregulated scenarios. The effects of regulation are most pronounced at Lanier.

ii) The differences between regulated and unregulated scenarios are generally exacerbated during dry years. At Lanier, these differences reach up to 500 cfs (September). At Woodruff, the regulated scenarios lead to lower releases than the unregulated scenarios for June, July, and August of up to 2,000 cfs (July).

c) Effects of Consumptive Uses:

i) Consumptive uses decrease releases, especially during dry years:

ii) Lanier: 300 cfs (April; 3 vs. 4);

iii) West Point: 390 cfs (May; 3 vs. 4);

iv) George: 570 cfs (November; 3 vs. 4);

v) Woodruff: 1,160 cfs (July; 3 vs. 4).

3) Recreation Impacts and Opportunities

a) Effects of Consumptive Uses:

i) Recreational impacts are generally higher in the scenarios with consumptive uses versus those without consumptive uses. These differences are in the range of 0 to 20%.

ii) Navigation Opportunities

b) Effects of Evaporation:

i) Navigation opportunities are slightly reduced with increasing evaporation at Chattahoochee (Apalachicola).

c) Effects of Regulation:

i) Navigation opportunities at Chattahoochee are slightly higher for unregulated scenarios (1, 2) than regulated scenarios (3) during January to May. However, regulation may increase navigation opportunities during the dry summer months, especially during droughts.

4) Current Consumptive Uses Targets and Deficits

a) Limited consumptive use shortages occur only at Griffin up to 10% of monthly average water supply targets during dry years (September).

5) Mean Monthly Flows

a) Effects of Evaporation:

i) Evaporation decreases spring/summer/fall average monthly flows:

ii) Atlanta up to 146 cfs (June; all years) and 180 cfs (June; dry years);

iii) Columbus up to 290 cfs (June; all years) and 350 cfs (June; dry years);

iv) Chattahoochee up to 560 cfs (May; all years) and 690 cfs (May; dry years).

b) Effects of Regulation:

i) Regulated scenarios (RIOP) generally result in lower winter/spring and higher summer/fall flows than unregulated scenarios. The effects of regulation are most pronounced at Atlanta.

ii) The differences between regulated and unregulated scenarios are generally exacerbated during dry years. At Atlanta these differences reach up to 515 cfs (February); at Columbus 1,200 cfs (March); and at Chattahoochee 1,100 cfs (March).

c) Effects of Consumptive Uses:

i) Consumptive uses decrease average monthly flows, especially during dry years:

ii) Atlanta: 615 cfs (April; 3 vs. 4);

iii) Columbus: 476 cfs (May/November; 3 vs. 4);

iv) Albany: 313 cfs (July; 3 vs. 4);

v) Chattahoochee: 1,160 cfs (July; 3 vs. 4).

6) Hydropower

a) Effects of Consumptive Uses:

i) Consumptive uses reduce energy generation from 1091 to 1040 GWH for all years, approximately 4.6% (annual federal; 3 vs. 4), and from 709 to 656 GWH in dry years, approximately 7.5% (annual federal; 3 vs. 4).

While the existing conditions model runs noted many observations, there are limits to the changes that can be made. A good example is the limited ability to augment system flows given current limited storage, as illustrated in Figure 3. The ability of the system to provide a flow augmentation (either flow in the absence of any rainfall or to provide flows exceeding inflow) depends on whether the reservoirs are full and the augmentation rate. As can be seen, even starting from full conservation pool, a flow augmentation of 5,000 cfs can only be maintained for approximately 165 days given existing storage. Existing storage can support higher augmentation rates for even less time.

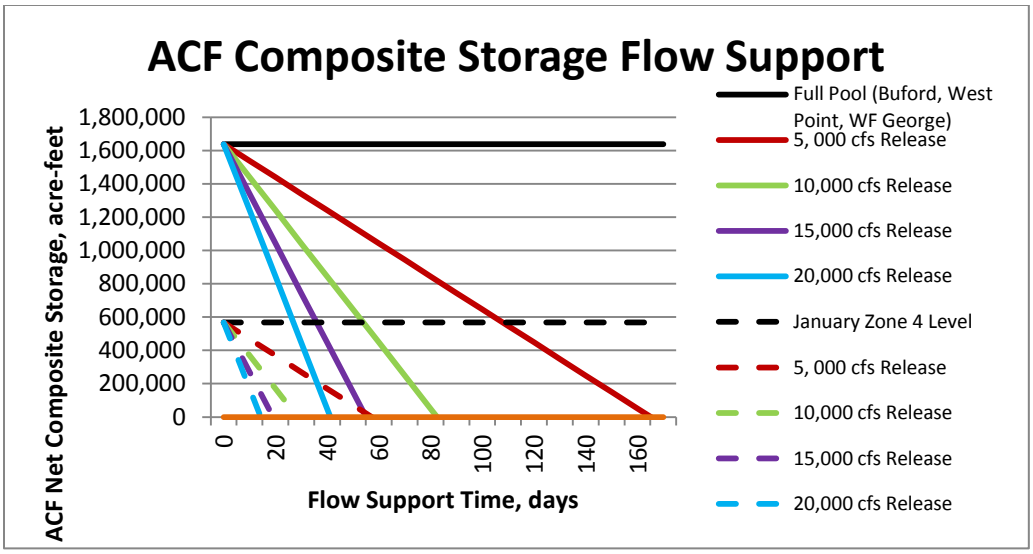


Figure 3 - ACF Composite Storage Flow Support

WATER MANAGEMENT ALTERNATIVES FOR ITERATIVE MODELING

The water management alternatives are proposed based on the shared understanding of observations developed during the existing conditions model runs, and stakeholder concerns identified during the performance metrics development. Consensus on the merits of one or more WMA's is the end result of the entire SWMP process.

ROUND ONE WATER MANAGEMENT ALTERNATIVES

The focus on the first round modeling approach is to incorporate as many stakeholder concerns as possible. This ensures that as many stakeholders as possible can receive and ultimately be better informed with information and analysis that might offer improvements for their concerns. This is both an equitable approach and a time saving one, to provide information to reach consensus in two rounds.

Round one of the modeling approach is also similar to the existing conditions modeling approach in that it will involve minimizing the number of variable changing at one time. This will help to ensure that the stakeholders will be able to tell what is causing an effect, whether improvements from existing conditions or potentially adverse effects from a water management alternative scenario. This approach also is intended to reveal tradeoffs as early in the iterative modeling process as possible and to foster collaborative problem solving by providing the basis for stakeholders to think together about the impacts of each proposal on others, whether positive or negative, and to design the round two scenarios to preserve improvements and address adverse effects.

The first modeling round will aim to assess WMAs that require minor changes to the ACF regulation rules (i.e., reservoir zones and RIOP curves) and will be assessed relative to all proposed stakeholder metrics. The project team initially developed the following alternative categories.

i. Alternative consumptive use levels by caucus and sector;

ii. Conservation storage change options at ACF reservoirs, including new storage at selected regions;
iii. Alternative inter-basin transfer levels;
iv. Different hydropower requirements under existing reservoir zones and RIOP curves;
v. Different reservoir ramp down outflow rates under existing reservoir zones and RIOP curves;
vi. RIOP implementation driven by (a) unimpaired and (b) impaired basin inflows;
vii. Other WMAs not requiring reservoir zone and RIOP functional changes.

To fit within the financial constraints, not all the categories could be included in the first round of modeling. The project team proposed including the following alternative categories i, ii, iii, v, and vi in Round 1. This approach is founded on Black & Veatch's review of the submitted WMA's relating stakeholder interest for each of the proposed Round 1 WMA categories to the original four categories. This analysis is summarized in Table 1 and shows a high percentage of classification agreement in the submitted WMAs for the proposed Round 1 WMA categories selected versus the original four categories.

Table 1 - Stakeholder Interest in Proposed Round 1 WMA Categories

Categories	Water Management Alternatives	Proposed Round 1 WMAs categories	
Demand	65% of WMAs identified alternative demand strategies.	i. Alternative consumptive use levels by caucus and sector;	iii. Alternative inter-basin transfer levels curves;
Returns	50% of WMAs identified alternative return strategies		
Storage	40% of WMAs identified alternative storage strategies	ii. Conservation storage change options at ACF reservoirs, including new storage at selected regions;	
Operations	53% of WMAs identified alternative operation strategies	v. Different reservoir ramp down outflow rates under existing reservoir zones and RIOP curves;	vi. RIOP implementation driven by (a) unimpaired and (b) impaired basin inflows;

Next, the project team reviewed each of the water management alternatives categories and proposed a specific ranges or criteria for each category.

Table 2 shows the submitted range of levels for the alternative consumptive use WMA category (i.) and the proposed levels of the modeling iterations.

Table 2 – (i.) Alternative Consumptive Use Levels Summary Category

Basins	Municipal Use	Agricultural Use	Power Use
Submitted Range of Levels			
Upper Chattahoochee	Reduce Municipal use by 20% to 25%, Increase Returns to 75% to 100%		Reduce thermal power use by 20%
Middle and Lower Chattahoochee	Reduce Municipal use by 20% to 25%, Increase Returns to 75% to 100%		Reduce thermal power use by 20%
Flint	Reduce Municipal use by 20% to 25%, Increase Returns to 75% to 100%	Reduce Agricultural Demand by 10% to 50%	Reduce thermal power use by 20%
Apalachicola	Reduce Municipal use by 20% to 25%, Increase Returns to 75% to 100%		Reduce thermal power use by 20%
Proposed Range of Levels			
Upper Chattahoochee	ChangeTotal Consumptive Use from Existing Conditions by Node: +/- 15%, +/-30%		
Middle and Lower Chattahoochee	Change Total Consumptive Use from Existing Conditions by Node: +/- 15%, +/-30%		
Flint	Change Total Consumptive Use from Existing Conditions by Node: +/- 15%, +/-30%		
Apalachicola	Change Total Consumptive Use from Existing Conditions by Node: +/- 15%, +/-30%		

Table 3 summarizes the range of changes submitted in WMAs related to changing the conservation storage at the ACFS reservoirs (ii.), and also what is proposed for the modeling iterations.

Table 3 – (ii.)Conservation Storage Change Options at ACFS reservoirs WMA Category

Categories	Submitted WMA's	Proposed Modeling WMA
Lanier	Current +- 2 ft.	Increase Lanier storage level by 2 vertical feet; additional storage augments all storage zones proportionally
West Point	Current +- 2 Ft.	Increase West Point winter storage level to 632.5 and proportionally adjust other storage zones; see WMA
W.F. George	No Change	No Change
Seminole	No Change	No Change
Flint	Utilize existing storage in upper Flint	No Change

Categories	Submitted WMA's	Proposed Modeling WMA
	government reservoirs to supplement low flows: as a first modeling step add an aggregate of 10 cfs to base flows at all times when flows at Carsonville drop below 75 cfs.	

Table 4 below summarizes the range of changes submitted as they relate to alternative inter-basin transfer WMA Category (iii) and the proposed criteria for the modeling iteration.

Table 4 – (iii) Alternative inter-basin transfer levels WMA Category

Submitted Range of Levels	
Upper Chattahoochee	Return all IBT losses into Basin. Implement Inter-Basin Tranfers into Lake Lanier that would satisfy 20% of demand.
Middle and Lower Chattahoochee	Return all IBT losses into Basin
Flint	Return IBT Flint Basin losses
Apalachicola	
Proposed Range of Levels	
Upper Chattahoochee	Return all IBT losses into Basin[2]
Middle and Lower Chattahoochee	Return all IBT losses into Basin[2]
Flint	Return all IBT losses into Basin[1]
Apalachicola	Return all IBT losses into Basin
Notes: *[1]9.1 MGD estimated by State of Georgia in May of 2010* *[2]GA EPD SUMMARY OF IBTs with 2009 Data*	

Table 5 below summarizes the range of changes submitted as they relate to different ramp down rates under existing reservoir zones and RIOP curves. Model runs with optimized reservoir zone and RIOP curves are proposed for Round 2 modeling and are discussed briefly in the next section.

Table 5 – (vi.)Different reservoir ramp down outflow rates under existing reservoir zones and RIOP curves

Categories	Submitted WMA's	Proposed Modeling WMA
Woodruff Dam	Remove all ramp down outflow requirements Eliminate ramp down rates for Action Zone 3 & 4. Suspend ramp down rates when flows<7,000 cfs for 30 days and resume when flows > 10,000 cfs for 30 days. Allow drought relief until Zone 1 is achieved.	Eliminate RIOP ramp rates

The final proposed water management alternative category was RIOP implementation driven by unimpaired and impaired basin inflows (vi). This category was developed based on stakeholder feedback and was documented in Georgia Water Resources Institute's (GWRI) Unimpaired Flow Assessment for the Apalachicola-Chattahoochee-Flint River Basin report in October 2012. In this report GWRI noted the following:

> *The currently defined basin inflow index is the combined unimpaired inflows that enter the ACF basin above and including J. Woodruff minus water withdrawals and evaporation losses. As a result, the basin inflow index does not represent unimpaired (natural) inflows but rather unimpaired inflows adjusted for the effects of water use withdrawals and reservoir evaporation losses.*

This potentially means that inflow will decrease based on increased future demands, requiring less flow release under current rules.

Round one modeling results will be presented to allow stakeholder discussion of the following:

- how much improvement over current conditions, if any, is predicted by the model for the effects / performance measures for which that scenario was intended?
- what other performance measures (stakeholder preferences) were improved?
- what performance measures were not significantly affected from current conditions?
- what performance measures were adversely affected?

OVERVIEW OF PROPOSED ROUND TWO WATER MANAGEMENT ALTERNATIVES

The second modeling round will aim to assess WMAs that allow for more substantive changes to the ACF regulation rules (i.e., reservoir zones and RIOP curves) while maintaining their functional structure. These WMA categories are more effort-intensive than those of Round 1 because they require ResSim recoding, use of ACF-DSS, and simultaneous consideration of selected Round 1 alternatives.

The project team initially developed the following alternative categories for Round 2:

i. Various stakeholder-suggested reservoir zone and RIOP curve modifications;
ii. Optimized reservoir zone and RIOP curves with respect to individual as well as collective stakeholder interests (including reservoir zone and RIOP curves optimized for environmental flow conditions);
iii. Selected (most promising) combinations of optimized reservoir zones, RIOP curves, and Round 1 WMAs.

To fit within the financial constraints, not all the categories could be included in the second round of modeling. The project team proposed including only category ii in Round 2.

OTHER RECOMMENDATIONS

There were a number of recommendations submitted with water management alternatives that cannot be modeled with a numeric model. For example, suggestions were received regarding improving the quantity and quality of information regarding flows and levels in the basin, withdrawals, and returns and standardizing permitting and reporting procedures. While these recommendations may not directly translatable into changing water flows into the basin, they may be of critical importance to future water planning and management efforts. These suggestions should be discussed within the ACFS for potential inclusion in the Sustainable Water Management Plan as recommendations to state agencies and/or the U.S. Army Corps of Engineers.

Appendix A. WMA Summaries

Responses in parenthesis indicate results from follow-up conversations with individual stakeholders by Black & Veatch. In addition, responses to what constitutes a measure of success for each of the alternatives are also summarized.

Changes in Water Use Summary

- 1. Purchase water from TVA to augment Metro Water Supplies by 40%. 2. Develop additional sub-surface storage capacity in suitable areas of Northern Georgia. Implement Inter-Basin Transfers into Lake Lanier that would satisfy 20% of demand. 4. Develop non-impoundment alternative surface water sources to supplement 20% irrigation water sources in S.W. Georgia. Evaluate augmentation of Apalachicola River flows by 10% from other water sources.
- Decrease agricultural irrigation by 25% in Lower Flint
- Decrease net water use in metro Atlanta by 20%
- Downstream Water Conservation Education and Credits (Assume 20% Reduction in Water Demand)
- Future power generation water needs should be consistent with Georgia Water Management Plan, Regional Water Management Plans, Thermal Power Forecasts. Do not assume private hydropower reservoir storage is readily available without consultation & compensation.
- Improve irrigation efficiency (Reduce Agricultural demand by 10%)
- Landscape irrigation
- Reduce agricultural use by 50%, municipal use by 25% below current use and increase returns from municipal returns to 80% of withdrawal across the board
- Reduce amount of water needed to flood Apalachicola cypress and tupelo swamps Reduce upstream consumption for urban MI&&E and irrigation for agriculture(Still Being Refined)
- Set a limit on water depletions from the basin based on maintaining a minimum flow regime defined by using the IFA for flows during a dry or drought period. This would be different than setting target flows that you shoot for.(Still Being Refined)
- Conduct a model run using the 2050 water demands. Apply to all nodes(Still Being Refined)
- Intent is make a model run that uses the four latest drought periods. THus, use a high average value for water demands appropriate for these drought years. Apply to all nodes.(Still Being Refined)
- Assume 20% reduction in municipal use for 2050 demand projections when composite storage is in Action Zone 3 or 4. Assume 20% reduction in Ag irrigation use for 2050 demand projections when composite storage is in Zone 3 or 4. Assume 20% reduction in thermal power use for 2050 demand projections. For bay salinity run, consider 1' sea level rise by 2050.
- Structural alternatives to reduce ACF project release requirements and downstream demands in the lower Chattahoochee River and Apalachicola River systems. These structural alternatives include: A. Renovation of Jim Woodruff Dam in order to reduce unnecessary releases necessitated by head limits due to structural integrity issues with the dam. B. Refurbishing the intake at Alabama Power's Plant Farley to allow the facility to meet water demand requirement at lower river flows. C. Restoring the river channel below Woodruff Dam on the Apalachicola River in Florida to address entrenchment issues and requirements for floodplain inundation. D.

Either closing or installing a lock at Sikes Cut on Apalachicola Bay in order to address salinity impacts on the Bay.
- Reduce water consumptive use by 25% across all water users.
- Limit Consumptive Water Depletions (all consumptive use - returns- evaporation) in the basin to 6% of UIF flow at the Chattahoochee gage on a daily, weekly, or monthly basis.
- "Move" an additional 20% of lower Flint ag withdrawals to deeper aquifers, those not having direct connection to surface flows. Model lower Flint ag withdrawals at 80%, 75%, and 70% of what they currently are (reductions of 20, 25, and 30%).

Changes in Water Returns Summary

- Assume 100% of the metro region's water is returned
- Increase net water returns in Metro Atlanta to 75%
- Increase percentage of out-takes that is returned to downstream flow (still being refined)
- Maximize all water returns. Stop any interbasin transfers out of the basin. (Implement Water Conservation Programs at the State and local levels in the entire ACFS Basin to reduce water consumptive uses by 33%)
- New WWTP should have limited recycle water as this is a consumptive use. (Increase Water Returns by 5%)
- Return IBT Flint basin losses. (9.1 MGD estimated by State of Georgia in May, 2010)
- Return lost flows to Upper Flint due to IBT of municipal systems
- Increase returns to 80% of withdrawals
- Conduct a model run using the 2050 water returns. Apply to all nodes
- Intent is make a model run that uses the four latest drought periods. Thus, use a low average value for water returns appropriate for these drought years. Apply to all nodes.
- a. Assume all municipal returns are 75% by 2050 and also consider 90%
  b. Return all IBTs > 1MGD back to ACF basin by 2050
- Increase percentage of out-takes that is returned to downstream flow
- Increase water returns to support less consumptive use goal of 25% reduction of consumptive use.
- Limit Consumptive Water Depletions (all consumptive use - returns- evaporation) in the basin to 6% of UIF flow at the Chattahoochee gage on a daily, weekly, or monthly basis.
- Model upper Flint returns (Griffin, Carsonville, and Montezuma gauges) at double, and 3 times, what they currently are (this will equate to 50% and 75% returns, more in line with the Metro standard/bar).

Changes in Water Storage Summary

- Change the Action Zones in Lake Lanier, specifically the top action zone increasing it by 2 feet
- Account for the losses from downstream flow due to non-USACE "reservoirs"
- Develop subsurface that provide a net annual increase in water supplies
- Eliminate small farm ponds for storing water for agricultural irrigation and pumping (Would Reduce Evaporation demand and resulting storage effects. Still Need to Refine.)
- Increase dam elevations on specific federal projects to allow more storage (Lake Lanier by 2 ft. And West Point by 2 ft.)
- Raise maximum storage pool at Lanier to El. 1073

- a. Raise L. Lanier full pool elevation by 2'
  b. Assume 200cfs ASR capacity south of Columbus node w/ water harvest @ Q > 5,000cfs (Columbus); ASR return, as needed, w/ Columbus min daily 1350cfs met
  c. Assume 500cfs from TVA into Buford node
  d. Create reservoir within a reservoir by deepening W. Point's shallows to create additional 100,000 ac-ft of storage w/o more evaporative losses and enhancing recreation across varying lake levels
  e. Assume 100,000 ac-ft in new off stem storage in upper and mid Flint
- Water level stability in at Morgan Falls Dam to reflect more natural flow volume and variation between Buford Dam and Morgan Falls Dam.
- Manage Lake Lanier to achieve a 2 feet increase in the conservation pool year round and increase the conservation pool at West Point to achieve an increase in winter storage levels by 4 feet.
- Use run of river as baseline and store water when flow loss does not exceed 6% loss of flow at the Chattahoochee gage.
- Utilize existing storage in upper Flint government reservoirs to supplement low flows: as a first modeling step add an aggregate of 10 cfs to baseflows at all times when flows at Carsonville drop below 75 cfs.

Changes in Lake Operation Summary

- Changes to the Rule Curve for West Point Lake. Diagram included in Appendix A (still being refined)
- Define Corps RIOP triggers for downstream releases to water use such that net withdrawals and evaporation are added back to basin inflow before basin inflow is determined
- Draw down each lake every 3-5 years. Do not permit additional residential uses of public reservoirs. (Require river levels to inundate the Apalachicola River Plain for a minimum of six consecutive weeks per year. Establish the minimum low flow of the ACF system at Jim Woodruff Dam at 9,000 cfs)
- Limit winter and spring reservoir spawning releases in drought years (May not be able to model)
- Measure lake inflow (rainfall plus streamflow) instead of estimate
- Reduce evaporation from reservoirs by 25% during droughts
- Study rule curves for all federal lakes
- a. Reduce winter draw down at W. Point by 3 feet (i.e. elevation 631 from Dec 1 - Mar 1)
  b. Eliminate ramp down rates for Action Zones 3 & 4
  c. Suspend ramp down rates when flows < 7,000cfs for 30 days and resume when flows > 10,000 cfs for 30 days.
  d. Allow drought relief until Zone 1 is achieved.
  e. Consider filling river bed entrenchment below Woodruff Dam with large concrete rubble to reduce amount of flow needed to meet environmental needs. e.g. 16,000cfs flows could be reduced to 13,000cfs to achieve same benefits.
  f. Consider cutting "windows" into river bank berms at critical flood plain inundation areas to get more inundation at lower flows, e.g. 14,000cfs benefits could be achieved at 10,000cfs
- Change the water release pattern at Buford Dam from the historical process, which uses extreme peaking discharges, to a more controlled process with far less hourly variation.
- Rule curve and reservoir balancing operations for the four Corps ACF projects is replaced by a simplified regime of reservoir releases whereby water is released from an upstream project to prevent the downstream reservoir from falling below a single specified target elevation. Releases are also made to meet local (immediately downstream) minimum instream flow targets and water

supply requirements. Hydropower operations are purely incidental and conjunctive to other releases. RIOP release requirements from the Woodruff project remain the same.

- Rule curve and reservoir balancing operations for the four Corps ACF projects is replaced by an alternative operations and management scheme as defined by a systems optimization performed by the Georgia Water Resources Institute (GWRI) Decision Support System (DSS) model.
- "Specific "power generation zones" are defined for the Buford, West Point and W.F. George projects. Hydropower generation under the WCM/RIOP operations is performed under the following rules:
  - In power zone 1, releases for 3 hours of generation are made on weekdays
  - In power zone 2, releases for 3 hours of generation are made on weekdays only when the peak energy price is "high" (mean temperature < 40 degrees or >= 80 degrees F)
  - Below power zone 2, hydropower generation is incidental and conjunction with other uses
  - All other ACF basin operations under the WCM/RIOP remain the same."
- Replace current RIOP release rules at Woodruff Dam with a flow regime designed to target the highest amount of sustainable spawning habitat, the best availability of sustainable floodplain connectivity, maximal amount of mussel habitat and the most economic use of system storage. These release rules and flow regime should include the ability to provide flow pulses to mimic natural flow variability and reduce flow flat lining. All other ACF basin operations under the WCM/RIOP remain the same, including current reservoir action zones.
- Change reservoir operations to follow the 'Georgia Contemplations' management provisions and/or a plan designed and evaluated by the Georgia Water Resource Institute as alternatives to the USACE RIOP.
- Run of river operations with storage of higher flows in the reservoirs during flow loss does not exceed the 6% loss of flow at Woodruff/Chattahoochee gage.
- Using expert modeler opinions develop a revised optimum RIOP that maximizes stakeholder performance metrics. This optimized RIOP should utilize predictive drought forecasting to manage river flows and lake levels.

Measure of Success of Individual Water Management Alternatives as included on the submitted WMA forms (The full set of measures of success from stakeholders is included as a Table Summary of Performance Metrics in Appendix 1 of the Metric Development Technical Memorandum)

- % of time IFA flows are met at Chattahoochee Locks
- Final approval of the plan
- Flows that sustain the environment are met and the limitations on depletions from the system are clear and defined.
- Improved stream flows and aquifer levels.
- Increase flows at Bainbridge Increase percent of flow at Florida line that comes from Flint
- Increase flows into Apalachicola River and higher reservoir levels.
- Meeting instream flow needs defined in the IFA on the Chattahoochee, Flint and Apalachicola River and Apalachicola Bay
- Percent of time IFA flows are met at Chattahoochee Locks
- Percent of time that IFA flows are met at Carsonville gauge.
- Power producers are able to meet future power customer demands reliably while maintaining required reserves utilizing all power producing technologies.

- Restore and maintain a healthy 7,500 acres of oyster beds in Apalachicola Bay. Restore and maintain aquatic freshwater sea grasses in Apalachicola Bay. Restore and maintain the .5 ppt isohaline soil salinity line in the marsh and delta of Apalachicola Bay.
- The reservoir levels remain higher during a drought while still achieving the required minimum flows into Apalachicola.
- Percent of time of seasonal floodplain inundation.
- The purpose of this run is to understand limitations of the system using a set of maximum demands.
- Intent of this run is to evaluate the basin under worst case stress conditions. This should help identify key problem areas where we need to focus development of WMA's to cope.
- 1. Reduce the Buford Dam peak discharge rates to a maximum of 3,000 cfs for non-flood conditions while maintaining the required daily average flows. 2. Reduce the transported sediment to lower the weekly average turbidity attributed to power generation discharges by at least 10% as measured at Norcross. 3. Coordinate with GA Power to maintain a minimum elevation at Morgan Falls Dam of 864 feet.
- Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.
- Meeting the water supply requirements for population centers, Increased lake levels and increased flow at the state line over broad range of hydrological conditions. A measure of success would also be to improve the environmental goals for the total basin.
- Meeting the UIF dry years pre dam flows less 6%) based on run of river with evaporative losses with no greater than a 6% loss of flow at the Chattahoochee gage as many stakeholder performance metrics as possible are maximized.

Appendix B. Raw Survey Forms and Attachments

Water Management Alternatives Form

Name *	George Martin
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Hydro Power • Thermal Power
Email *	gamartin@southernco.com
Phone Number	(404) 506-1357
1. Changes to Water Use	Future power generation water needs should be consistent w/ GA Water Mgt Plan, Regional H2O Mgt. Plans, Thermal Power Forecasts. Do not assume private hydropower res. storage is readily available w/out consultation & compensation.
If known, check the primary node locations that apply	• Atlanta • Whitesburg • Columbus • Chattahoochee • Bainbridge
2. Changes to Water Returns	
If known, check the primary node locations that apply	• Atlanta • Whitesburg • Columbia • Chattahoochee • Bainbridge
3. Changes to Storage	
If known, check the primary node locations that apply	• Atlanta • Whitesburg • Columbus • Chattahoochee • Bainbridge
4. Changes to Lake Operations	
If known, check the primary node locations that apply	• Atlanta • Whitesburg • Columbus • Chattahoochee • Bainbridge

Key Alternative Assumptions	Future thermal power needs consideration will be consistent with the GA Water Mgt Plan, Regional Water Mgt Plans, Thermal Power Forecasts and Management Practices. Do not assume private hydropower reservoir storage is readily available with out consultation with private ownership and possible compensation for lost storage, energy production and capacity to generate.
Measure of Success:	Power producers are able to meet future power customer demands reliably while maintaining required reserves utilizing all power producing technologies.
Legal / Public Policy Considerations:	The cost of meeting federal flow requirements should not be passed on to utility rate payers and stockholders through the loss of comparably low private hydropower reservoir storage, necessitating power replacement by higher cost generation technologies.
Implementation Risk / Uncertainty:	Without appropriate water management the risk of disregarding the reasonable use of water riparian right and not complying with a regulated utility's duty-to-serve customer demand must be considered.
Cost?	
Other Information	
Attach a File?	

Created		Updated
1 Nov 2012 8:11:06 AM	146.126.51.51 IP Address	1 Nov 2012 10:09:39 AM
PUBLIC		PUBLIC

Incomplete

Water Management Alternatives Form

Name *	Woody Hicks
Which Caucus do you represent?	Flint
Performance Metrics will relate to which Stakeholder Interest categories?	
Email *	whicks@jonesctr.org
Phone Number	(229) 734-4706
1. Changes to Water Use	Improve irrigation efficiency
If known, check the primary node locations that apply	• Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
2. Changes to Water Returns	Return IBT Flint basin losses
If known, check the primary node locations that apply	• Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
3. Changes to Storage	Increase dam elevations on specific federal projects to allow more storage
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Limit winter and spring reservoir spawning relases in drought years
If known, check the primary node locations that apply	
Key Alternative Assumptions	Learn to manufacture more water: should be simple; only two components.....H2O
Measure of Success:	Improved stream flows and aquifer levels.

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Legal / Public Policy Considerations:	Reservoir operations on federal projects (COE).
Implementation Risk / Uncertainty:	None
Cost?	Some, but less than other alternatives
Other Information	
Attach a File?	

Created	IP Address	Updated
1 Nov 2012 2:06:22 PM	64.39.150.151	1 Nov 2012 2:16:32 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	David McLain
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Seafood Industry • Environment & Conservation
Email *	firstresponse@fairpoint.net
Phone Number	(850) 653-6454

1. Changes to Water Use	Reduce upstream consumption for urban MI&&E and irrigation for agriculture
If known, check the primary node locations that apply	• Lake Lanier • Atlanta • Whitesburg • Albany
2. Changes to Water Returns	Increase percentage of out-takes that is returned to downstream flow
If known, check the primary node locations that apply	• Lake Lanier • Atlanta • Whitesburg • Columbus • W. George • Albany • Bainbridge
3. Changes to Storage	Account for the losses form downstream flow due to non-USACE "reservoirs"
If known, check the primary node locations that apply	• Norcross • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Albany
4. Changes to Lake Operations	Measure lake inflow (rainfall plus streamflow) instead of estimate
If known, check the primary node locations that apply	• Lake Lanier • West Point Lake • West Point Gage

	• W. George
Key Alternative Assumptions	Not available

Measure of Success:

Legal / Public Policy Considerations:

Implementation Risk / Uncertainty:

Cost?

Other Information

Attach a File?

Created	IP Address	Updated
2 Nov 2012 11:36:23 AM	209.105.173.147	2 Nov 2012 11:58:42 AM
PUBLIC		PUBLIC

67%

Water Management Alternatives Form

Name *	Roger Martin
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Environment & Conservation
Email *	criverwarden@gmail.com
Phone Number	(706) 649-2326

1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	

Created		Updated
2 Nov 2012	98.88.63.84	2 Nov 2012
2:53:59 PM	IP Address	2:56:00 PM
PUBLIC		PUBLIC

67%

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Water Management Alternatives Form

Name *	Dan Tonsmeire
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Environment & Conservation
Email *	dan@apalachicolariverkeeper.org
Phone Number	(850) 508-7787
1. Changes to Water Use	reduce ag use by 50%, municipal use by 25% below current use and increase returns from municiple returns to 80% of withdrawal across the board
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Columbia • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
2. Changes to Water Returns	see above increase returns to 80% of withdrawals
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake

	• West Point Gage • Columbus • W. George • Columbia • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
3. Changes to Storage	Illiminate small farm ponds for storing water for ag irrigation and pumping
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Columbia • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
4. Changes to Lake Operations	Define Corps RIOP triggers for downstream releases to water use such that net withdrawals and evaporation are added back to basin inflow before basin inflow is determined
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta

- Whitesburg
- West Point Lake
- West Point Gage
- Columbus
- W. George
- Columbia
- Chattahoochee
- Griffin
- Carsonville
- Montezuma
- Albany
- Bainbridge
- Woodruff
- Chattahoochee
- Blountstown
- Sumatra

Key Alternative Assumptions	In order for these alternatives to be implemented the water demands information has to be revised so that evaporation is separated, defined and specified. Accuracy of the water use and water balance document must be in cinch. There cannot be "missing water" from the system or at least it must be accounted for.
Measure of Success:	meeting instream flow needs defined in the IFA on the Chattahoochee, Flint and Apalachicola River and Apalachicola Bay
Legal / Public Policy Considerations:	aggressive water conservation, restrictions on permitting water use for ag and municipal, increased returns to the system, change in consumption requirements before reductions in downstream flows are made by the Corps, respecting instream flow requirements, and equity in sharing water.
Implementation Risk / Uncertainty:	will cost money and commitment by upstream users to meet the goals and implement strong policies.
Cost?	
Other Information	Comparison of differences using improved UIF or alternative UIF data set needs to be demonstrated so we know the relative difference in using the old or a new improved data set.
Attach a File?	leitman_contract__basin_inflow__setting_triggers_122408... 89.00 KB · DOC

Created		Updated
2 Nov 2012 6:16:48 PM	8.26.245.159 IP Address	2 Nov 2012 6:59:08 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	David McLain
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Seafood Industry • Environment & Conservation
Email *	firstresponse@fairpoint.net
Phone Number	(850) 653-6454

1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	

Created **5 Nov 2012** 4:36:36 PM	**209.105.173.147** IP Address
PUBLIC	

33%

Water Management Alternatives Form

Name *	Dan Tonsmeire
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Environment & Conservation
Email *	dan@apalachicolariverkeeper.org
Phone Number	(850) 508-7787
1. Changes to Water Use	Set a limit on water depletions from the basin based on maintaining a minimum flow regime defined by using the IFA for flows during a dry or drought period. This would be different than setting target flows that you shoot for but can never know if you ar
If known, check the primary node locations that apply	• Atlanta • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	Assumptions are that the basin has a limit to the water that can be withdrawn from the system. This approach provides that when their is water above the dry or drought period that the environment gets additional flows rather than being held in a perpetual dry or drought condition. Withdrawals are easier to control than to shoot for target flows after everyone takes their water.

Measure of Success:	Flows that sustain the environment are met and the limitations on depletions from the system are clear and defined.
Legal / Public Policy Considerations:	Limits on growth based on water usage
Implementation Risk / Uncertainty:	Limits on growth
Cost?	
Other Information	Easier to manage
Attach a File?	

Created	IP Address	Updated
5 Nov 2012 6:52:26 PM	209.105.138.223	5 Nov 2012 7:01:55 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	Dan Tonsmeire
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Seafood Industry • Environment & Conservation
Email *	dan@apalachicolariverkeeper.org
Phone Number	
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	Restore and Maintain a healthy 7,500 acres of oyster beds in Apalachicola Bay. Restore and maintain aquatic freshwater sea grasses in Apalachicola Bay. Restore and maintain the .5 ppt isohaline soil salinity line in the marsh and delta of Apalachicola Bay.
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	

Created	IP Address	Updated
5 Nov 2012	209.105.138.223	5 Nov 2012
7:04:57 PM		7:08:37 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	Wilton Rooks
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Recreation
Email *	wilton@rooks.us
Phone Number	(678) 200-8070
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	• Lake Lanier
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	All other performance metrics remaining the same. I would like to see the impact on reservoir levels and flows into Apalachicola River from a change in the Action Zones in Lake Lanier, specifically the top action zone raised by 2 feet.
Measure of Success:	The reservoir levels remain higher during a drought while still achieving the required minimum flows into Apalachicola.
Legal / Public Policy Considerations:	The USACE will have to conduct a feasibility and probably an environmental study to implement the 2 feet addition to the full pool level.
Implementation Risk / Uncertainty:	The US Congress will have to appropriate the funds to perform the study by the USACE.
Cost?	An estimate of $2 million has been suggested for the study. The costs to actually implement the 2 feet addition is not known. However, Lake Lanier has been above 1073 over 300 times so the

	structural issues associated with Lake Lanier do not appear to be a concern.
Other Information	The lake is very seldom at 1071 and we would not expect the lake to be at 1073 on any greater frequency. This would simply provide a higher starting point for the lake to support downstream requirements during drought conditions. No suggestion is being made as to allocation of the additional 26 Billion gallons of water.
Attach a File?	

Created		Updated
5 Nov 2012 7:15:28 PM	76.97.200.49 IP Address	5 Nov 2012 7:27:28 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	Wilton Rooks
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Recreation
Email *	wilton@rooks.us
Phone Number	(678) 200-8070
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	• Atlanta • Whitesburg
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	The metro region were to increase returns to the Chattahoochee by 20%. All other performance metrics remaining the same.
Measure of Success:	Increase flows into Apalachicola River and higher reservoir levels.
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	Very large investments in waste water utility resources.
Cost?	Very large. DeKalb County would have to expend major funding to decrease discharges to the South River and return those discharges to the Chattahoochee River. Similar for Fulton Co and the city of Atlanta.
Other Information	The challenges associated with reducing withdrawals with an increased in population seem unlikely to be met. However, other utilities could follow the lead of Gwinnett County with major investments to return more water to the Chattachoochee. It is the

net consumption that really matters.

Attach a File?

Created	IP Address	Updated
5 Nov 2012 7:28:31 PM	76.97.200.49	5 Nov 2012 7:34:12 PM
PUBLIC		PUBLIC

Complete

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Water Management Alternatives Form

Name *	Roger Martin
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Environment & Conservation
Email *	criverwarden@gmail.com
Phone Number	(706) 649-2326
1. Changes to Water Use	Downstream Water Conservation Education and Credits
If known, check the primary node locations that apply	
2. Changes to Water Returns	New WWTP should have limited recycle water as this is a consumptive use.
If known, check the primary node locations that apply	
3. Changes to Storage	Raise max storage pool at Lanier to 1073
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Study rule curves for all fedreal lakes
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	

Created		Updated
12 Nov 2012	98.88.63.221	12 Nov 2012
9:00:52 AM	IP Address	9:06:23 AM
PUBLIC		PUBLIC

67%

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Industry & Manufacturing
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	Decrease agricultural irrigation by 25% in lower Flint
If known, check the primary node locations that apply	• Bainbridge
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	Increase in sod based farming Greater adoption of water saving irrigation techniques Continued moratorium on new wells in lower Flint
Measure of Success:	Increase flows at Bainbridge Increase percent of flow at Florida line that comes from Flint
Legal / Public Policy Considerations:	How to create a "hard hammer" for farmers who do not wish to comply. How to utilize crop insurance to ameliorate the costs during drought years.
Implementation Risk / Uncertainty:	How to determine amount of use.
Cost?	Cost of retrofitting center pivot systems not using drops x number of such systems.

Cost of converting to sod based farming

Other Information

Attach a File?

Created	IP Address	Updated
26 Nov 2012 8:50:52 AM	12.28.163.146	26 Nov 2012 9:01:25 AM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Industry & Manufacturing
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	Return lost flows to upper Flint due to IBT of municipal systems
If known, check the primary node locations that apply	• Carsonville
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	Most of infrastructure is already in place to implement this diversion from current practice.
Measure of Success:	Percent of time that IFA flows are met at Carsonville gauge.
Legal / Public Policy Considerations:	How to get wastewater treatment plants to agree to contract buyouts.
Implementation Risk / Uncertainty:	
Cost?	Pumping and diversion costs.
Other Information	
Attach a File?	

Created		Updated
26 Nov 2012	12.28.163.146	26 Nov 2012
9:02:04 AM	IP Address	9:15:50 AM

PUBLIC	PUBLIC
Complete	

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Industry & Manufacturing
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	Increase net water returns in Metro Atlanta to 75%
If known, check the primary node locations that apply	• Whitesburg • Chattahoochee
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	Increase penetration of sewers into metro area currently served primarily by septic tanks
Measure of Success:	Percent of time IFA flows are met at Chattahoochee Locks
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	Infrastructure cost. Probably $5B+.
Other Information	
Attach a File?	

Created		Updated
26 Nov 2012 9:19:08 AM	12.28.163.146 IP Address	26 Nov 2012 9:22:05 AM

PUBLIC	PUBLIC
Complete	

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Industry & Manufacturing
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	Decrease net water use in metro Atlanta by 20%
If known, check the primary node locations that apply	• Lake Lanier • Whitesburg • Chattahoochee
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	Increased conservation Reduced outdoor watering
Measure of Success:	Percent of time IFA flows are met at Chattahoochee Locks.
Legal / Public Policy Considerations:	Will have to get many governmental entities to agree to participate.
Implementation Risk / Uncertainty:	
Cost?	Low cost if implemented over time.
Other Information	
Attach a File?	

Created	IP Address	Updated
26 Nov 2012	12.28.163.146	26 Nov 2012

9:22:34 AM	9:25:38 AM
PUBLIC	PUBLIC

Complete

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Industry & Manufacturing
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Reduce evaporation from reserviors by 25% during droughts
If known, check the primary node locations that apply	• Lake Lanier • West Point Gage • Chattahoochee
Key Alternative Assumptions	Evaporation is the single largest use in the system. There are technologies for bringing colder water to the surface for reducing the evaporation rate.
Measure of Success:	% of time IFA flows are met at Chattahoochee Locks
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	Unknown what the most cost effective technology is.
Cost?	Unknown without exploring alternatives.
Other Information	
Attach a File?	

Created	IP Address	Updated
26 Nov 2012	12.28.163.146	26 Nov 2012

9:26:07 AM	9:28:53 AM
PUBLIC	PUBLIC

Complete

Water Management Alternatives Form

Name *	Bill McCartney
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Water Supply
Email *	osbornerr@gmail.com
Phone Number	(850) 509-9059
1. Changes to Water Use	Supply Augmentation & Demand Reduction
If known, check the primary node locations that apply	
2. Changes to Water Returns	Maximize all water returns. Stop any interbasin transfers out of the basin.
If known, check the primary node locations that apply	
3. Changes to Storage	Develop subsurface that provide a net annual increase in water supplies
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Draw down each lake ever 3-5 years. Do not permit additional residential uses of public reservoirs
If known, check the primary node locations that apply	
Key Alternative Assumptions	Not enough water in the system to support existing needs without serious conservation or supply augmentation
Measure of Success:	Final approval of the plan
Legal / Public Policy Considerations:	COE to reconcile all environmental concerns with priority of all authorizations
Implementation Risk / Uncertainty:	Restoration of navigation capabilities may not be n the best interests of the basin or the economy
Cost?	Provide revenue services from water uses to augment supplies or implement conservation programs

Other Information	All alternatives should provide a net improvement in the water management needs of the basin without serious adverse impacts to any other area.
Attach a File?	acf_alternatives_11512.pdf 48.26 KB · PDF

Created		Updated
3 Dec 2012 10:03:01 AM	147.182.5.150 IP Address	10 Dec 2012 11:18:39 AM
ACFS		ACFS

Complete

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

ACF STAKEHOLDERS
PROPOSED WATER MANAGEMENT ALTERNATIVES
From: Bill McCartney, ACFS Governing Board Member

TO: Consulting Team and Facilitators. Please consider the following as Alternatives to be evaluated for recommendations in the ACFS Sustainable Water Management Plan. The Alternatives are divided into 22 Recommendations in seven Categories. These are: Water Supply Augmentation; Water Demand Reduction; Static Water Uses; Institutional Considerations; Environmental Sustainability; Structural/Non-Structural Operation and Management; and Flows. Please consider the following:

WATER SUPPLY AUGMENTATION

1. Purchase Water from TVA to augment Atlanta Metro water supplies.

2. Develop additional sub-surface storage capacity in suitable areas of Northern Georgia

3. Implement Inter-Basin Transfers into Lake Lanier and Metro Atlanta supplies from surface water rivers and lakes in North Georgia including Lakes: Hartwell, Nottley, Burton, Blue Ridge, Rabun, Carters, Alltoona, Chatuge, and Weiss.

4. Develop non-impoundment alternative surface water sources from ponds/lakes to supplement irrigation water sources in S.W. Georgia.

5. Evaluate augmentation of Apalachicola River flows from other surface water sources in Florida and S.E. Alabama.

WATER DEMAND REDUCTION

1. Implement Water Conservation Programs at the State and local levels in the entire ACFS Basin to reduce water consumptive uses by 33 percent.

2. Implement Water Conservation Rate Structures for all public water supplies in the Basin.

3. Develop functional Agricultural Water Use Permitting to include: maximum daily uses, maximum weekly uses, well spacings, valid metering of all wells and intakes, inspections, and establish moving conservation thresholds based on potentemetric levels in established agricultural permitting zones.

4. Recommend that all water supply systems (public and private) reduce leakage to less than ten percent of the system's water production.

5. Develop supplemental water supplies from sources which are not adequate for potable uses for cost effective non-potable uses.

STATIC WATER USES

1. Do not allow private residential uses of water front properties on new or expanded public reservoirs.

2. Require all recreation facilities to have alternative facilities for low water levels.

ENVIRONMENTAL SUSTAINABILITY

1. Require river levels to inundate the Apalachicola River Plain for a minimum of six consecutive weeks per year.

2. Require each major reservoir on the ACFS System to be drawn down at least once every three years to manage sediment, fisheries, and habitat.

3. Restore degraded watersheds discharging into the ACF System.

INSTITUTATIONAL CONSIDERATIONS

1. Establish a Basin Water Resource Management Institution to optimize the water management programs in the Basin, including: emergency water supply planning, authority to cut back all uses pursuant to established thresholds, promote water related supplies from outside the Basin, authority to collect a water use fee or severance tax on all metered water uses up to $0.10 per 1,000 gallon for water management and conservation programs in the Basin.

2. Recommend local Governments to Develop a Stormwater Management Plan and manage related stormwater facilities.

3. Recommend the development of Comprehensive Sub-State Regional Water Management Authorities in the Basin.

STRUCTURAL/NON-STRUCTURAL WATER MANAGEMENT: OPERATIONS AND MANAGEMENT

1. Restrict and eliminate Apalachicola River flows in the Gulf Intercoastal Waterway West of Lake Wimico discharging into St. Joseph Bay and East Bay of the St. Andrews Bay System.

2. Conduct cost/benefit evaluation of each improvement on the ACF System and proposed the elimination of all impoundments which do not have a wet positive coverall benefit to the System.

3. Recommend that the Flint River be given the status of a Special State Resource (e.q. "Outstanding Florida Water" in FL) to be managed as a unique natural system for environmental tourism and natural habitat for native plant and animal species.

FLOWS

1. Establish the minimum low flow of the ACF System at Jim Woodruff Dam at 9,000 CFS.

Note: While all the above Alternatives can not be evaluated by a computer model, they are all an essential consideration for a Sustainable Water Management Plan for the ACF Basin.

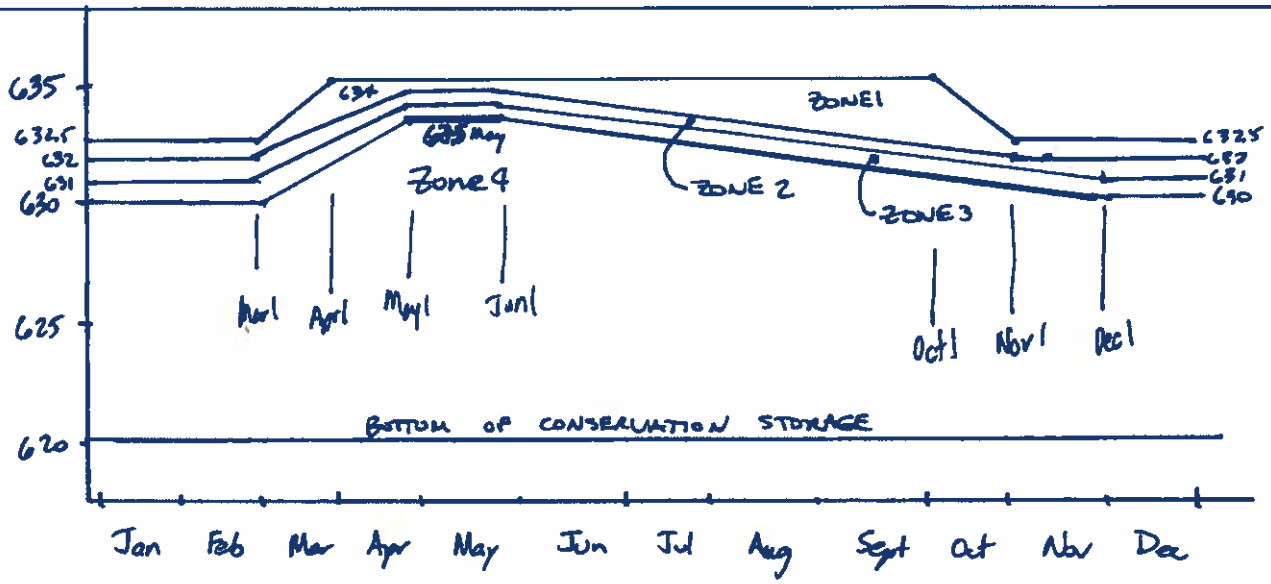
Water Management Alternatives Form

Name *	James Emery
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	
Email *	osbornerr@gmail.com
Phone Number	
1. Changes to Water Use	N/A
If known, check the primary node locations that apply	
2. Changes to Water Returns	N/A
If known, check the primary node locations that apply	
3. Changes to Storage	N/A
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Changes to the Rule Curve. See attached diagram
If known, check the primary node locations that apply	• West Point Lake
Key Alternative Assumptions	
Measure of Success:	
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	west_point_lake_rule_curves.pdf 59.52 KB · PDF

Created		Updated
3 Dec 2012	147.182.5.150 IP Address	3 Dec 2012

10:14:13 AM	10:16:07 AM
ACFS	ACFS

Complete



PROPOSED WEST POINT LAKE

RULE CURVES

Water Management Alternatives Form

Name *	Tim Thoms
Which Caucus do you represent?	Flint
Performance Metrics will relate to which Stakeholder Interest categories?	• Urban Agriculture
Email *	tim@thomstrees.com
Phone Number	(770) 461-6013
1. Changes to Water Use	landscape irrigation
If known, check the primary node locations that apply	• Norcross • Morgan Falls • Atlanta • Whitesburg • Griffin
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	
Cost?	
Other Information	
Attach a File?	

Created	74.176.99.237	Updated

7 Dec 2012 10:54:43 AM	IP Address	7 Dec 2012 10:57:18 AM
PUBLIC		PUBLIC

67%

Water Management Alternatives Form

Name *	James McClatchey
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Environment & Conservation
Email *	jnm@saf.com
Phone Number	(404) 355-1560
1. Changes to Water Use	Reduce amount of water needed to flood Apalachicola cypress and tupelo swamps.
If known, check the primary node locations that apply	• Sumatra
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	• Sumatra
Key Alternative Assumptions	Deposit silt or boulders in the thalweg of the Apalichicola where it has been dredged or altered. Return the elevation of the thalweg to its historical level thus reducing the amount of water needed to inundate the Apalachicola floodplain.
Measure of Success:	Percent of time of seasonal floodplain inundation.
Legal / Public Policy Considerations:	
Implementation Risk / Uncertainty:	Time to restore the thalweg.
Cost?	Unknown amount to return spoil or add boulders to thalweg.
Other Information	
Attach a File?	

Created	68.16.78.226	Updated

13 Dec 2012 11:04:22 PM	IP Address	13 Dec 2012 11:10:03 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form #28

Name *	Brad Moore
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Navigation • Recreation • Water Quality • Water Supply • Farm Agriculture • Industry & Manufacturing • Seafood Industry • Hydro Power • Thermal Power • Local Government • Environment & Conservation • Business & Economic Development • Urban Agriculture
Email *	bmooreless@gosuto.com
Phone Number	(334) 616-7888
1. Changes to Water Use	Conduct a model run using the 2050 water demands. Apply to all nodes
If known, check the primary node locations that apply	
2. Changes to Water Returns	Conduct a model run using the 2050 water returns. Apply to all nodes
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	
Key Alternative Assumptions	
Measure of Success:	The purpose of this run is to understand limitations of the system using a set of maximum demands.

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Legal / Public Policy Considerations:	None
Implementation Risk / Uncertainty:	Could be a risk if we believe the 2050 values under-state the bounding demands we want to evaluate.
Cost?	None
Other Information	
Attach a File?	

Created **5 Mar 2013** 5:26:24 PM	12.7.234.2 IP Address	Updated **5 Mar 2013** 5:31:35 PM
PUBLIC		**PUBLIC**

Complete

Water Management Alternatives Form #29

Name *	Brad Moore
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Navigation • Recreation • Water Quality • Farm Agriculture • Industry & Manufacturing • Seafood Industry • Hydro Power • Thermal Power • Local Government • Environment & Conservation • Business & Economic Development • Historic & Cultural • Urban Agriculture
Email *	bmooreless@gosuto.com
Phone Number	(334) 616-7888
1. Changes to Water Use	Intent is make a model run that uses the four latest drought periods. THus, use a high average value for water demands appropriate for these drought years. Apply to all nodes.
If known, check the primary node locations that apply	
2. Changes to Water Returns	Intent is make a model run that uses the four latest drought periods. THus, use a low average value for water returns appropriate for these drought years. Apply to all nodes.
If known, check the primary node locations that apply	
3. Changes to Storage	None
If known, check the primary node locations that apply	
4. Changes to Lake Operations	None
If known, check the primary node locations that apply	
Key Alternative Assumptions	

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Measure of Success:	Intent of this run is to evaluate the basin under worst case stress conditions. THis should help identify key problem areas where we need to focus development of WMA's to cope.
Legal / Public Policy Considerations:	None
Implementation Risk / Uncertainty:	Making this run will probably involve using a subset of the UIF for drought years.
Cost?	None
Other Information	
Attach a File?	

Created	IP Address	Updated
5 Mar 2013 5:32:42 PM	12.7.234.2	5 Mar 2013 5:40:13 PM
PUBLIC		PUBLIC

Complete

Water Management Alternative Submittal Form

Contact Information:

Contact Name: Steve Davis	
Which Caucus do you represent? Mid Chatt	
What stakeholder interests does this water management alternative address? Water Quality	
Telephone Number:706-649-3430	E-mail Address: sdavis@cwwga.org

Alternative Description
Describe your alternative by providing information in the following four categories.

1. **Changes to Water Use:** Water use refers to water that is actually used for a specific purpose, such as for domestic use, irrigation, or industrial processing**.**

   a. *Assume 20% reduction in municipal use for 2050 demand projections when composite storage is in Action Zone 3 or 4*
   b. *Assume 20% reduction in Ag irrigation use for 2050 demand projections when composite storage is in Zone 3 or 4*
   c. *Assume 20% reduction in thermal power use for 2050 demand projections*
   d. *For bay salinity run, consider 1' sea level rise by 2050*

2. Changes to Water Returns: Water return refers to water released from wastewater treatment plants or water returned to the environment.

a. Assume all municipal returns are 75% by 2050 and also consider 90%
b. Return all IBTs > 1MGD back to ACF basin by 2050

3. Changes to Storage: Storage could include additional lakes or basins for the storage, regulation, and control of water or other means, such as Aquifer Storage and Recovery.

a. Raise L. Lanier full pool elevation by 2'
b. Assume 200cfs ASR capacity south of Columbus node w/ water harvest @ Q > 5,000cfs (Columbus); ASR return, as needed, w/ Columbus min daily 1350cfs met
c. Assume 500cfs from TVA into Buford node
d. Create reservoir within a reservoir by deepening W. Point's shallows to create additional 100,000 ac-ft of storage w/o more evaporative losses and enhancing recreation across varying lake levels
e. Assume 100,000 ac-ft in new off stem storage in upper and mid Flint

4. Changes to Lake Operations: Describe any changes to current reservoir operations.
a. Reduce winter draw down at W. Point by 3' (i.e. elev 631 from Dec 1 - Mar 1)
b. Eliminate ramp down rates for Action Zones 3 & 4
c. Suspend ramp down rates when flows < 7,000cfs for 30 days and resume when flows > 10,000 cfs for 30 days
d. Allow drought relief until Zone 1 is achieved

e. Consider filling river bed entrenchment below Woodruff Dam with large concrete rubble to reduce amount of flow needed to meet environmental needs. e.g. 16,000cfs flows could be reduced to 13,000cfs to achieve same benefits
f. Consider cutting "windows" into river bank berms at critical flood plain inundation areas to get more inundation at lower flows, e.g. 14,000cfs benefits could be achieved at 10,000cfs

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Additional Information

Measure of Success: Describe your quantitative and/or qualitative measures of success.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Upload Relevant Files or References
May be attached or sent electronically to Black & Veatch, osbornerr@bv.com

Water Management Alternatives Form #31

Name *	Charles Freed
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Recreation • Environment & Conservation
Email *	cfreed2@bellsouth.net
Phone Number	(678) 641-8471
1. Changes to Water Use	N/A
If known, check the primary node locations that apply	
2. Changes to Water Returns	N/A
If known, check the primary node locations that apply	
3. Changes to Storage	Water level stability in at Morgan Falls Dam to reflect more natural flow volume and variation between Buford Dam and Morgan Falls Dam.
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls
4. Changes to Lake Operations	Change the water release pattern at Buford Dam from the historical process, which uses extreme peaking discharges, to a more controlled process with far less hourly variation.
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls
Key Alternative Assumptions	The reduced peak release plan can be accomplished through a combination of controlling the number of active turbines and the volume through each turbine, similar to the present operation at Morgan Falls Dam. Required average daily discharge rates could be maintained the while implementing a pattern of significantly lower peaks.
Measure of Success:	1. Reduce the Buford Dam peak discharge rates to a maximum of 3,000 cfs for non-flood conditions while maintaining the required daily average flows. 2. Reduce the transported sediment to lower the weekly average turbidity attributed to

	power generation discharges by at least 10% as measured at Norcross. 3. Coordinate with GA Power to maintain a minimum elevation at Morgan Falls Dam of 864 feet.
Legal / Public Policy Considerations:	The recommended changes would also have positive impacts on environmental and water quality conditions on the 36 river miles between Buford Dam and Morgan Falls Dam.
Implementation Risk / Uncertainty:	None.These changes could be implemented quickly and easily.
Cost?	There would be no cost to implement this discharge pattern. Scoping recommendations submitted to the USACE indicate that there would be several economic benefits: 1. Local economies and park revenues would benefit from the increased recreation activity throughout the CRNRA. 2. The resulting reduced sediment/turbidity would decrease the related maintenance costs for DeKalb and Fulton Counties' water treatment plants that have intakes on the Upper Chattahoochee near Alpharetta. 3. There is a potential for lower energy cost to consumers.
Other Information	Most importantly, this reduced peak release plan would pose less danger to approximately one million visitors to the CRNRA from rapidly rising water levels and current flow rates between Buford Dam and Morgan Falls Dam. The recommended changes would significantly improve recreation and ecology along the Chattahoochee between Buford Dam and Morgan Falls Dam.
Attach a File?	atlanta_rowing_club_comments__usace_scope_for_acf_master_control_manual_... 680.16 KB · PDF

Created		Updated
12 Mar 2013 10:35:20 AM	99.39.98.194 IP Address	12 Mar 2013 11:37:25 AM
PUBLIC		PUBLIC

Complete

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

Jan 10, 2013

Atlanta Rowing Club
P.O. Box 500937
Atlanta, GA 31150
ATTN: Charles Freed
cfreed2@bellsouth.net
www.atlantarow.org

U.S. Army Corps of Engineers (USACE)
Mobile District Office
Mobile, Alabama
ACF-WCM@usace.army.mil

Re: USACE ACF Master Control Manual Update.

Focus: Recreational and ecologic concerns for the Upper Chattahoochee River between Buford Dam and Morgan Falls Dam

Thank you for the opportunity to share with the USACE the concerns of recreational users of the Upper Chattahoochee River. As stakeholders we ask the USACE to include our concerns within the scope of study as you prepare the ACF Master Control Manual Update process.

Six rowing clubs with over 600 members use the 6.5 mile section of the Chattahoochee between the GA400 Bridge and Morgan Falls Dam throughout the year. These rowers represent: The Atlanta Rowing Club, The Atlanta Junior Rowing Association, Georgia Tech Crew, Georgia State Crew, Saint Andrew Rowing Club and the Westminster Schools Rowing Club. These non-profit clubs work to ensure safety on the water, develop the skills of new young and adult rowers and compete locally and nationally. They collaborate in events that have raised over $300,000 for the Susan G Komen for the Cure Foundation. The Atlanta Rowing Club has developed an adaptive rowing program for those who are physically or mentally challenged. The Atlanta Rowing Club sponsors and manages the largest rowing regatta in the Southeast, “Head of the Hooch”. The 2012 two-day regatta hosted over 7,000 rowers of all ages, from 30 states and 4 foreign countries. This event generated an estimated economic impact of over $4,000,000 for the Chattanooga area (Chattanoogan, 2012).

We are very concerned over threats to recreation and the long term ecology of the river. When the elevation at Morgan Falls Dam is at or above 864 feet there is adequate depth for rowing the 6.5 mile section above the dam. The long term average water level (elevation) at Morgan Falls Dam is 865 feet (USGS 2335810). This is the only section of the Chattahoochee in the Atlanta area that is suitable for rowing. In addition to rowers, a large number of people use this section of the river to kayak, canoe, raft, tube, or fish. We are deeply concerned about the gradual loss of water depth in this area to sedimentary deposits and the loss of the ecosystem.

This special environment and its recreational use are threatened by the sedimentary deposits which have been related to the discharge patterns at Buford Dam. These patterns yield dramatic changes in flow rate and water levels, increased turbidity, riverbank erosion,

unnecessary deposition of sediment and loss of capacity at Bull Sluice Lake. Additional concerns for public safety and several impacts of turbidity levels will be presented. We recommend changes in the pattern of water releases at Buford Dam. More controlled, gradual discharges would reduce risks to public safety, enhance recreational use and could slow the deposition of sediment deposits in the area. Specific details are in the following sections.

Until the river can be dredged, we feel that it is critical to take actions that will mitigate the growth of sandbars and deposits to this section of the river as soon as possible. Therefore we request that the items that follow be considered in this scoping effort.

Thank you for the opportunity to comment on these important issues. We would welcome your visit to Atlanta to join us in touring this section of the Chattahoochee and discussing the relevant issues.

For the Atlanta Rowing Club:

Charles Freed, Second Vice President, Atlanta Rowing Club

Supported By:

Kristen Fowks, President, Atlanta Rowing Club

Dottie Cecil, President. Atlanta Junior Rowing Association

Ellen Kish, President, Saint Andrew Rowing Club

Rob Canavan, Head Coach, Georgia Tech Crew

Jarc Klc, Head Coach, Georgia State Crew

For
Christine Wright, Head Coach, Westminster Schools Rowing Club

Table of Contents

Topic **Page**

Introduction 4
Background - Recreation on the Upper Chattahoochee 4
Background - Buford Dam Discharge Patterns 4
Specific Requested Items for Inclusion in the ACF Scoping Phase:
1. Public Safety 5
2. Erosion / Sedimentation 5
3. Effects of Erosion and Sediment Transport on Bull Sluice Lake 6
4. Impact of Turbidity on Fishing 7
5. Effects of Transported Sediment on Water Treatment Costs 7
6. Challenges for Morgan Falls Dam Operation 8
7. Buford Dam's Role in Regional Power, On-Peak Power and Related Economics 8
Summary of reasons to include the above items in the scope tasks for the Upper Chattahoochee 10
Recommendation 10
Benefits 10
Figure 1. Peaking discharge patterns from Buford Dam 12
Figure 2. Discharge patterns over 20 miles downstream from Buford Dam 13
Figure 3. Turbidity at Norcross for average flow of 1,170 cfs 14
Figure 4. Turbidity at Norcross for average flow of 2,320 cfs 15
Figure 5. Chattahoochee River Exposed Sandbar and Morgan Falls Dam Water Level 16
Figure 6. Effect of Buford Dam discharges on Bull Sluice Lake water levels 17
Table 1. Upper Chattahoochee turbidity study 18
Table 2. Indexed calculations of suspended sediment 18
Table 3. Summary of turbidity changes at Norcross 18
Table 4. Buford Dam Peak Discharge Timing 19
References 20

Introduction

This document requests items for inclusion in the scoping phase of the USACE ACF Master Control Manual Update. These remarks address the 36 mile section of the Chattahoochee between Buford Dam and Morgan Falls Dam with special focus on the 6.5 mile section above Morgan Falls Dam.

The timeframes for the USGS data that are used in the various figures were selected to represent typical recent data (October & November, 2012). In order to show consistency of data, a ten day timeframe with zero measured rainfall was selected. The same 10-day period was used for all examples with two exceptions. Figure 5 (June 2012) was selected to coordinate with a photograph of typical sandbar exposures seen with water levels on that day. The dates for Table 4 were selected to examine the hottest two weeks of 2012. Days 13 and 14 of this period had about 0.7" of precipitation which was not relevant to the point of that table.

This document will recommend reduction of the peak levels of Buford Dam's discharges. This would improve recreational safety and reduce ecological impacts, without affecting the daily average river flow rates or generated power required to satisfy the interests of other river stakeholders.

Background - Recreation on the Upper Chattahoochee

The 36 mile section of the Chattahoochee between Buford Dam and Morgan Falls Dam is part of the Chattahoochee River National Recreation Area (CRNRA). The CRNRA corridor provides 70% of the public green space in the metropolitan Atlanta area. More than 3 million people visit the CRNRA annually, with approximately 1 million of these visitors taking part in river-based recreational activities (KellerLynn, 2012). The 6.5 mile stretch of river from the GA400 Bridge to Bull Sluice Lake has adequate water depth for rowing, kayaking, canoeing and small motorized boat use.

The Chattahoochee River Water Trail was the first river to be designated as a National Water Trail by the US Department of Interior (USDI, 2012). The Georgia Department of Natural Resources Environmental Protection Division classifies the designated uses of the Chattahoochee River from Buford Dam to Peachtree Creek as Drinking Water and Recreation (GADNR 1997). The river and its highly utilized riverbank parklands also provide habitat for wildlife. The cold water output from Lake Lanier creates one of the southernmost trout streams in the United States (Chattahoochee Riverkeeper web, 2012).

Background - Buford Dam Discharge Patterns

The daily discharges from Buford Dam typically follow a pattern of approximately 20 hours of low flow (600 cfs) followed by 3 or 4 hours of extremely high discharge rates between 5,500 cfs and 10,700 cfs. Discharge peaks can build to a maximum quickly at unpredictable times. The mean discharge rate at Buford Dam is 1,140 cfs (USGS Site 2334430). This type of discharge pattern is analogous to driving a car 15 miles in one hour using only 2 speeds - either 6 or 100 mph. In recent months the average flow rate has increased to 2,200 cfs with more frequent periods of high peak flows. (USGS Site 2334430) (See Figure 1).

High flow rates and irregular discharge cycles from Buford Dam result in the loss of valuable shore line, negative impacts on general recreation along the 36 river miles and unnecessary sediment deposits above Morgan Falls Dam. For rowers, low water levels and high currents result in increased safety risks, and the inability to plan consistent workouts for regional/national competitions. A rowing shell for 8 rowers is 60 feet long, weighs 200 pounds, has a 12" draft and costs $35,000. Damages to boat hulls and equipment due to striking

sandbars and underwater hazards that are normally under several feet of water costs tens of thousands of dollars annually.

1. Public Safety

Suggested Scope - Include development of a historical data base of incidents including rescues and fatalities on the Chattahoochee between Buford Dam and Morgan Falls Dam to measure progress in this critical area.

Discussion - Since approximately one million visitors to the CRNRA take part in river-based recreational activities, public safety should be a high priority for scope considerations. The Buford Dam discharges vary wildly on a daily basis (Southern Company 2006). Rescue operations and fatalities related to high peak discharges at Buford Dam have been documented. For example, Gwinnett's water rescue team responded to the river 7 times in 2008, 9 in 2009 and 11 times in 2010. They also responded to 2 fatalities in those years (Green, 2011). USACE has commented on how the Upper Chattahoochee can turn dangerous quickly, with gauge height increases up to 11 feet within minutes (Coghlin, 2011).

High variability in flow rate and gauge height also occurs throughout the 36 river miles above Morgan Falls Dam. The USGS Sites at Norcross and Above Roswell, which are over 20 miles downstream of Buford Dam, register current peaks in excess of 3,000 cfs. Rapid changes in flow rate (up to 5:1 increases) can pose risks to wading fishermen and other recreational users (See Figure 2).

2. Erosion / Sedimentation

Suggested Scope - Include a study of the relationships of Buford Dam operations on turbidity, erosion and sedimentation in the area above Morgan Falls Dam.

Discussion - High discharge rates can result in significant increases in erosion, sediment transport, turbidity and pronounced daily and hourly river level fluctuations (Faye, 1980). The Dept of Interior Geological Survey paper observed that relatively severe bank erosion had occurred along the Chattahoochee River downstream of Buford Dam (Faye, 1980).

Several studies have demonstrated an exponential relationship between flow rates and suspended sediment or turbidity in river water (e.g. Cherry 1976: Colby 1956: Ryan & Emmett 2002). A 1980 USGS report (Faye, 1980) presented data from a study of the Upper Chattahoochee and its tributaries (Table 1). Faye found that the relationship between instantaneous stream flow rates and suspended sediment was explained by the exponential function: $C=aQ_i^b$

Where:

C = suspended sediment concentration, mg/L

Q_i = instantaneous stream flow, cfs

a & b = regression constants.

Faye included 3 data sets from days when runoff could have affected the relationship between instantaneous flow rate and suspended sediment (Table 1). When these three data sets with runoff effects are excluded, the resulting function should focus on the effects of instantaneous flow rate on transported sediment. The a & b regression constants for the remaining 14 data sets (Faye1980) were averaged to be conservative and to balance differences in channel characteristics along the 36 river miles between Buford Dam and Morgan Falls Dam. The resulting function is $C=2.61Q_i^{1.16}$.

Calculations indicate that a 770% increase in flow rate (from the 1,140 cfs average to 10,000 cfs peaks) could result in a 1,120% increase in suspended sediment. This function was used to develop an indexed model for calculation of the effects of different flow rates on the suspended sediment concentrations. Four different discharge rates were used to achieve the historical average of 1,140 cfs for two examples of peak discharge patterns. These cases assume the peaks to be rectangular in shape while they actually are approximately trapezoidal.

Case 1: (present pattern) 94% discharge at 600 cfs and 6% at 10,000 cfs

Case 2: (reduced peaks pattern) 77% discharge at 600 cfs and 23% at 3,000 cfs

These two cases of discharge patterns were combined with the respective suspended sediment concentrations indicated by the exponential function. The resulting suspended sediment values for Cases 1 and 2 were indexed using the values for the 1,140 cfs average as the base (% Suspended Sediment at % Flow X % Time at the Case discharge rates). A comparison of these two indexed cases indicated that reducing the discharge pattern peaks from 10,000 cfs to 3,000 cfs could reduce the net suspended sediment concentration by 10% (See Table 2).

This conclusion is supported by the USGS data at Norcross (USGS 2335000), the only site in this 36 mile section of the river that records turbidity levels. That USGS data confirm that the number and magnitude of peaking turbidity levels in that area increase significantly with increasing discharge rates (See Figures 3 and 4, and Table 3). The low turbidity levels are approximately equal at 5 FNU, indicating that the level and duration of the peak values affect the average turbidity by about 10%.

3. Effects of Erosion and Sediment Transport on Bull Sluice Lake

Suggested Scope - For this topic we have two suggestions for inclusion in the scope phase:

1. Development of a model using available USGS data to monitor changes in the Morgan Falls storage capacity. Such a model could include a combination of net flows in the Morgan Falls impoundment and the rate of change in elevation of Bull Sluice Lake to provide a storage volume relationship. Such a model could be used as often as necessary.
2. Implement a study of transported sediment above and below the Morgan Falls impoundment to provide an additional indicator of sediment deposited within the impoundment.

Discussion - Previous studies addressed potential active erosion within the Morgan Falls Dam impoundment (GA Power-1, 2006). The transported sediment that is being deposited appears to be the result of erosion well upstream of the impoundment as noted by the turbidity patterns observed at the Norcross USGS site (see Fig 3 & 4, and Table 3.)

The rowing community is active on the Morgan Falls impoundment daily, year-round. Our frequent observations of the river conditions indicate that the transported sediment has been causing increasing sandbar growth (in numbers and size) over 6 miles above Morgan Falls Dam. Several sandbars upstream of Morgan Falls Dam now span half the river width (See Figure 5). These growing sandbars force the river traffic into narrowing channels creating potential safety issues. When the Morgan Falls elevation is below 864, the water above these sandbars is too shallow for safe rowing and small power boats.

Furthermore, the deposits above Morgan Falls Dam have formed a large area of very shallow water within 50 yards upstream of the Dam. The growth of these deposits and upstream sandbars continue to reduce the available storage behind the dam.

The 2004 study of the storage capacity at Morgan Falls Dam referenced 2001 aerial photography during a drawdown to 859 feet to establish a bottom profile that was used to estimate the usable storage capacity at that time. The resulting conclusion was that sediment deposition appeared to be approaching equilibrium within the Morgan Falls impoundment (GA Power-2, 2004). The observations of sandbar growth since 2001 would indicate that the storage capacity continues to decline significantly.

4. Impact of Turbidity on Fishing

Suggested Scope - Include a study of the impact of varying the Buford Dam peak discharge levels on turbidity measurements at Norcross.

Discussion - Excess turbidity in the river can clog fish gills impacting disease resistance, fish growth and development of eggs and larva. As the particles settle, they can cover the stream bottom and smother fish eggs and invertebrates in the food chain (US EPA, 2012).

A Georgia DNR study investigated fishing at 17 sites on approximately 25 miles of the Chattahoochee from Buford Dam to Roswell Road. This study developed a metric for measuring fishing harvest with their calculation of “catch per unit effort (CPUE)”. The investigation found that average rainbow trout fishing results declined precipitously by over 75% (from an average CPUE of 0.64 to 0.13) when the turbidity level exceeded 12 NTU. This study also concluded that 16.5°C was the highest comfortable water temperature for trout (Klein, 2003).

The USGS graphs (Figures 3 and 4) and the summarized observations in Table 3 show that turbidity at Norcross regularly exceeds the 12 NTU level with higher peaks at a higher stream flow (discharge) rates.

The impact of average daily discharge temperature was considered for Cases 1 and 2 above. The typical 11.5°C discharge temperature at 600 cfs and the highest 15.3°C (typically in October) for the peak discharges were used for this calculation. For these two cases, the daily average discharge temperature is estimated to increase from 11.5°C for Case 1 to 12.2°C for Case 2. Therefore, reducing the peak discharge rates does not appear to have a detrimental on river temperatures which should be below 16.5°C for trout health.

5. Effects of Transported Sediment on Water Treatment Costs

Suggested Scope - Include a study of the effect of reducing Buford Dam discharge peaks on turbidity and the related water treatment plant costs.

Discussion - Increases in suspended sediment / turbidity in the river water can cause increased maintenance & process costs (e.g. coagulants, filters) for the treatment of the Atlanta/Fulton and DeKalb water intakes located in Alpharetta between Buford Dam and Morgan Falls Dam. A study on the Willamette River concluded that a 1% decrease in turbidity from the source water would result in a 0.25% to 0.35% decrease in the amount of sediment-related treatment costs (State of Oregon, 2010). This cost savings could be significant for an average 10% turbidity reduction.

Additionally, a Georgia Environmental Protection Division Guidance Manual for Preparing Public Water Supply System O & M Plans, May, 2000 has multiple recommendations related to turbidity and maintenance (Georgia EPA 2000).

6. Challenges for Morgan Falls Dam Operation

Suggested Scope - Include a study of the effect of reducing Buford Dam's discharge peaks on the stability of Chattahoochee water elevation at Morgan Falls Dam.

Discussion – Reducing the discharge peaks would partially re-regulate the Buford Dam output. Buford Dam controls 76% of the Chattahoochee flow leading to Morgan Falls Dam (GA Power-3, 2004). The Georgia Power operators at Morgan Falls monitor 3 USGS gauges upstream of the Morgan Falls reservoir to meet the Atlanta Regional Commission's request for a minimum flow of 750 cfs below Morgan Falls at Peachtree Creek. The Buford discharge schedules are not useful to operators because they can change at any time and it takes 12 hours for Buford releases to arrive at Morgan Falls (GA Power-3, 2004).

Morgan Falls Dam operators achieve good results in re-regulating the downstream flow. However, the widely varying discharges from Buford Dam, often results in Chattahoochee gauge height cycles above Morgan Falls Dam of 6 feet or more (e.g. down from 865 to 862 then rising to 866) over 36 hours (USGS 2335810). When the Morgan Falls elevation is below 864, the sandbars and other submerged hazards create unsafe conditions for rowing and small power boats (See Figures 5 and 6).

7. Buford Dam's Role in Regional Power, On-Peak Power and Related Economics

Suggested Scope - Include a sensitivity study based on reducing Buford Dam's discharge peaks while maintaining the historical daily average power generated. The study would include effects on the power system, public safety, recreation and transported sediment.

Discussion, Generation Capacity - Power generated at Buford Dam appears to be a minor contribution to the public energy needs. The Southeastern Power Administration (SEPA) lists four "Systems" in the Southeast. Buford Dam is one of the ten dams in SEPA's GA-AL-SC System (SEPA web). The generation capacity of the Buford Dam hydro units is about 115 MW. Comparing Buford Dam's capacity to other electrical power sources in the SEPA GA-AL-SC System shows that Buford Dam's generating capacity is a relatively minor factor in the GA-AL-CS System and far less influence in that 3 state geographical area. Buford's capacity is:

- Less than 5% of SEPA's GA-AL-SC System hydro power capacity
- Less than 3% of the total Hydro generation capacity in GA, AL and SC
- Less than ½% of the total generating capacity in GA, AL and SC

Discussion, On-Peak Power - The timing of the 14 Buford Dam peak discharges that occurred during the hottest two weeks in 2012 (6/23 - 7/6/2102) is summarized below (see Table 4):

- The average daily elapsed time for all discharges was 3 hours. The weekday daily average was 3.4 hours.
- 18% of the weekday peak discharges were during the full 16:00 - 20:00 late afternoon times of on-peak demand
- 55% of the weekday peak discharges lasted for less than the full on-peak demand times
- 27% of weekday discharges occurred at off-peak demand times
- 36% of all discharges occurred at off-peak demand times such as midnight, or early afternoon

This pattern for the hottest time period in the year is similar to most other times, indicating that supporting peak power needs is not necessarily a priority for Buford Dam operations. Discharge from Buford Dam is often reduced on weekends causing severe lowering

of the river levels affecting recreation on weekends and/or into the following week (See Figures 5 and 6). In these two weeks there was no discharge on Saturday 6/23.

Discussion, Power Generation Economics - The data in the USACE Hydropower Analysis indicates that the energy generated by Buford Dam has a baseline average annual energy value of $9.3 million or 6% of the total value of the nine dams in the ACF Hydropower System. Only Morgan Falls Dam with 3% of the system's capacity has a lower annual energy value. Buford Dam's energy value per MWH is $84/MW, the lowest of all 9 stations. The second lowest is West Point at $153/MW, nearly twice that of Buford Dam (USACE 2012). This indicates that the variable cost of an alternative thermal generation resource to replace lost hydropower generation is significantly lower for Buford Dam than other hydropower stations on the AFC system. Therefore reducing the Buford Dam peak discharge levels, while maintaining the average daily power generation, should have a minimal effect on the power system.

The following is a consideration of the average daily price for the generated power at Buford Dam. The USACE Hydropower Analysis projected future average generation prices of one MWH of on-peak and off-peak electricity energy (USACE, 2012). These prices were used in combination with the average weekday daily peak discharge duration (3.4 hours) from Table 4 to examine the weighted daily generation price for two cases (present and reduced peak discharge patterns). The on-peak and off-peak prices per MWH used in these cases are the average prices from USACE 2012 for June, July & August. Discharges for Case 4 were set to produce the same total daily discharge, and therefore the same average power generated via the large turbines, as Case 3.

Case 3: (present pattern) 3.4 hours discharge of 10,000 cfs at on-peak price of $96 and 20.6 hours of 600 cfs at off-peak price of $59.

Case 4: (reduced peaks pattern) 3.4 hours discharge of 3,000 cfs at on-peak price of $96, 9.9 hours discharge of 3,000 cfs at off-peak price of $59 and 10.7 hours of 600 cfs at off-peak price of $59.

For both cases the 24 hour average energy price was $64 per MWH, confirming that reducing the discharge peaks to 3,000 cfs would result in the same average energy price. Since hydropower is a relatively constant low cost, the higher the price during generation results in more cost effective power to the consumer. Given the conservative approach used for these cases, it appears that generating for a longer period of time at 3,000 cfs could have better financial results than using 10,000 cfs peaks for short times because:

A. Case 3 assumed that all of the peak generation was at 10,000 cfs, averaged 3.4 hours daily and occurred at times of on-peak power prices. The data shows that the only 2 days had 10,000 cfs peaks, while peaks for the other 12 days averaged less than 6,000 cfs. The 14 day average peak generation lasted only 3.0 hours daily and only 64% of the discharges were during on-peak price time (see Table 4).
B. Case 4 assumed that all power generated beyond 3.4 hours was at the off-peak price. The 3,000 cfs discharges actually would span more hours of on-peak price time, thus producing more low cost hydropower when prices would be higher.

The above figures indicate that Buford Dam's generation is not a major factor in the supplying the system average power requirements and discharging at 10,000 cfs is not required to meet on-peak demands. This is supported by USACE comments that releases are determined to meet water supply and minimum flow of Peachtree Creek with hydropower not being a direct factor (Robbins 2012).

If necessary, much of the other 95% of the available hydro power in this geographic region could be used to meet peak demand without detrimental effects on the 36 mile section of the river above Morgan Falls Dam. Additionally, there are several alternatives for fast response

peaking power sources in combustion turbine facilities. For example, in nearby Jackson County, GA, Southern Company operates Plant Dahlberg. This plant consists of 10 combustion turbine units, with a combined capacity of 810 megawatts, about 7 times Buford's generating capacity (Southern Company web).

Summary of reasons to include the above items in the scope tasks for the Upper Chattahoochee

The 600 members of the rowing clubs that use the Chattahoochee feel that we are witnessing the slow disappearance of a unique environment of the river above Morgan Falls Dam due to excessive sedimentary deposition. The present pattern of the Buford Dam discharges has serious impacts on rowing safety (people and equipment) and the ability to enjoy this venue, as well as long term impacts on the river's ecology. International rowers have commented that this is one of the best rowing venues anywhere due to the 6.5 mile length of relatively flat water, it's year round availability, the protection from most strong winds provided by the river valley and the beautiful scenery.

It is critical to take actions that will improve conditions for general recreation and mitigate the growth of sandbars and deposits that result from the Buford Dam discharge patterns. We therefore recommend the following changes in Buford Dam operations to preserve this unique resource.

Recommendation

The Atlanta Rowing Club's recommendation is to change the water release pattern at Buford Dam from the present process, which uses extreme peaking discharges, to a more controlled process with far less hourly variation. This reduced peak release plan can be accomplished through a combination of controlling the number of active turbines and the volume through each turbine, similar to the present operation at Morgan Falls Dam. Average daily discharge rates could be maintained the while implementing a pattern of significantly lower peaks. These changes could be implemented quickly and at low cost. The specific objectives of the change to a reduced peak discharge plan should be:

1. Reduce the peak discharge rates and subsequent gauge height peaks so as to significantly reduce the risks to the general public. We propose a 6 month test in 2013. Given the benefit to public safety, reducing the peak discharges levels should be a high priority in 2013, before the seasonal increase in recreation within the Chattahoochee River National Recreation Area.
2. Reduce the transported sediment to lower the weekly average turbidity attributed to power generation discharges by at least 10% as measured at Norcross.
3. Coordinate with GA Power to maintain a minimum water level (elevation) at Morgan Falls Dam of 864 feet.

Benefits

The reduction in discharge peaks to meet the above objectives would result in the following benefits:

1. **Improved Public Safety** - This reduced peak release plan would pose less danger from rapidly rising water levels and current flow rates between Buford Dam and Morgan Falls Dam.
2. **Reduced Sedimentary Disposition** - Lower peak flows could reduce the total transported sediment by over 10%, mitigating the increasing silt deposits that restrict

recreation upstream of Morgan Falls Dam. This would also slow the growth of sediment deposits that reduce the Morgan Falls storage capacity required to re-regulate downstream flow.

3. **Improved Conditions for Recreation** - The recommended plan would eliminate the dramatic changes in water levels and stream flow rates that affect rowing, general recreation and ecology above Morgan Falls Dam.
4. **Improved Fishing** - The reduction in transported sediment and turbidity would produce healthier conditions for trout.
5. **Reduced Water Treatment Costs** - The resulting reduced sediment/turbidity would decrease the related maintenance costs for DeKalb and Fulton Counties' water treatment plants that have intakes on the Upper Chattahoochee near Alpharetta.
6. **Economic Benefits** - Local economies and park revenues would benefit from the increased recreation activity throughout the CRNRA. There is also a potential for lower energy cost to consumers.
7. **Consistent With ACF Stakeholders Objectives** - This proposed controlled discharge plan should not affect the daily average river flow rates, the average daily power generated at Buford Dam, or conflict with the interests of other ACF Stakeholders.

Figure 1. Peaking discharge patterns from Buford Dam (USGS 2334430)

Figure 1a. Buford Dam discharge at 1,165 cfs average discharge rate = 10 Discharges > 5,500 cfs (including 5 at 10,000 cfs) from 10/19 - 10/28/2012 (USGS 2334430)

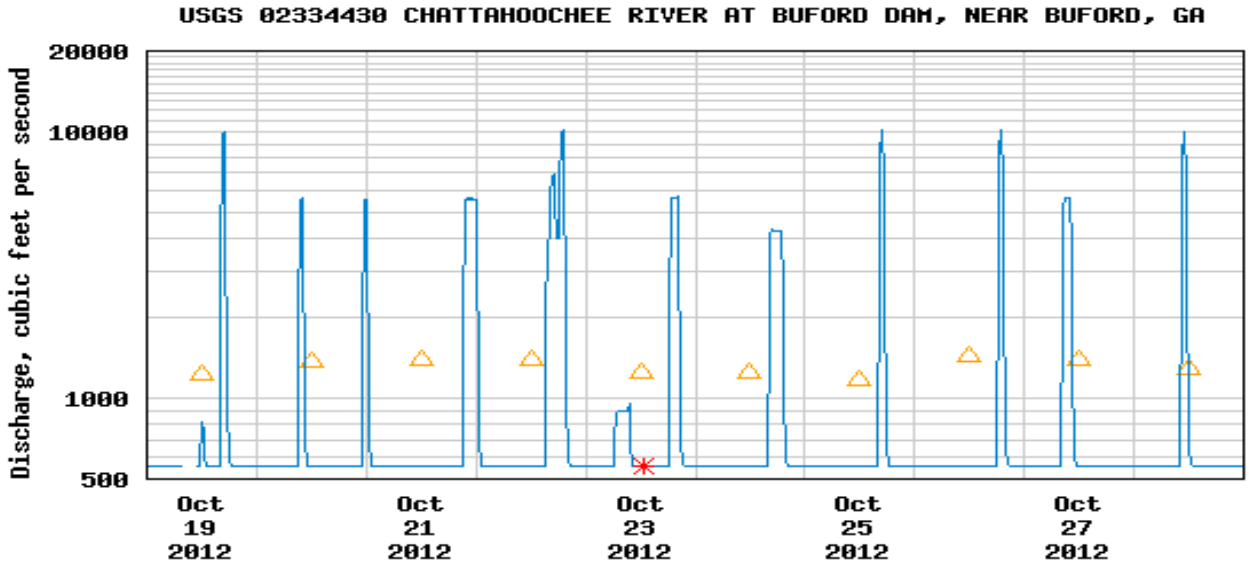
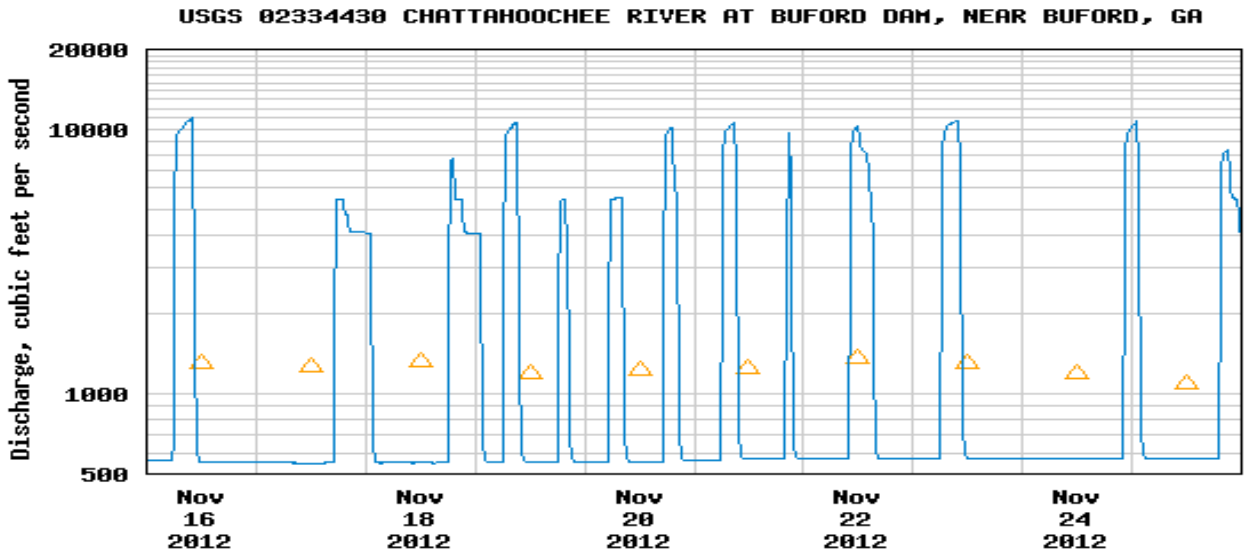


Figure 1b. Buford Dam discharge at 2,230 cfs average discharge rate = 13 Discharges > 5,500 cfs (including 8 at over 10,000 cfs) from 11/16 - 11/25/2012 (USGS 2334430)



- **The Buford Dam discharge pattern remains in "on-off" control mode, varying from 600 cfs to 5,500 - 10,000 cfs at both 1,165 and 2,230 cfs average discharge rates.**

Figure 2. Discharge patterns over 20 miles downstream from Buford Dam

Figure 2a. Norcross discharge at 1,170 cfs average = 10 cycles from 700 cfs to over 2,000 cfs 10/19 - 10/28/2012 (USGS 2335000)

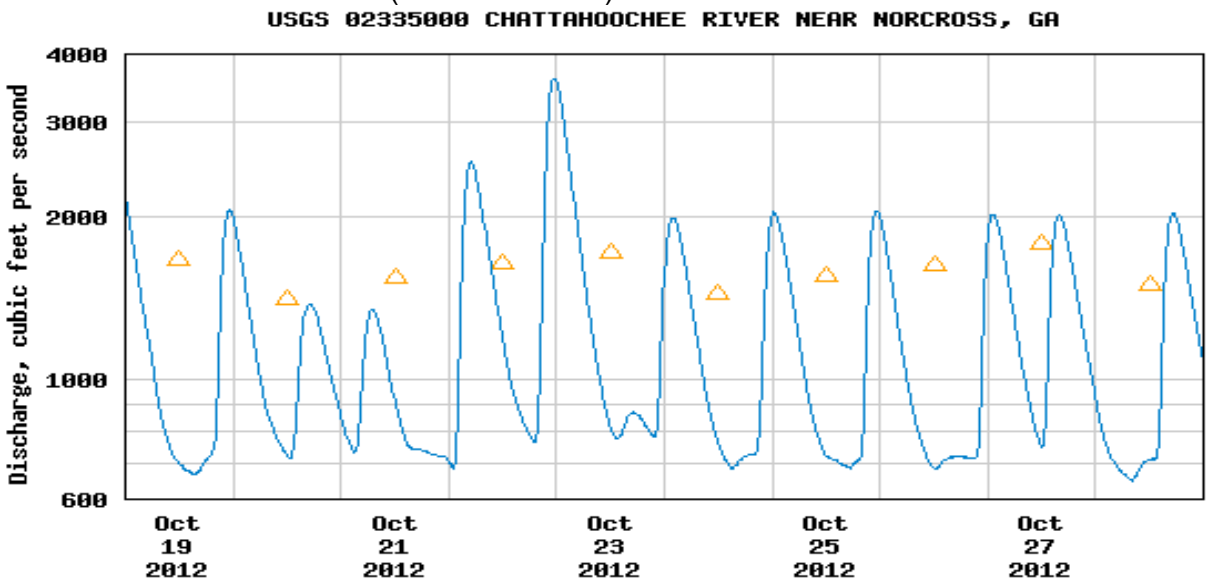
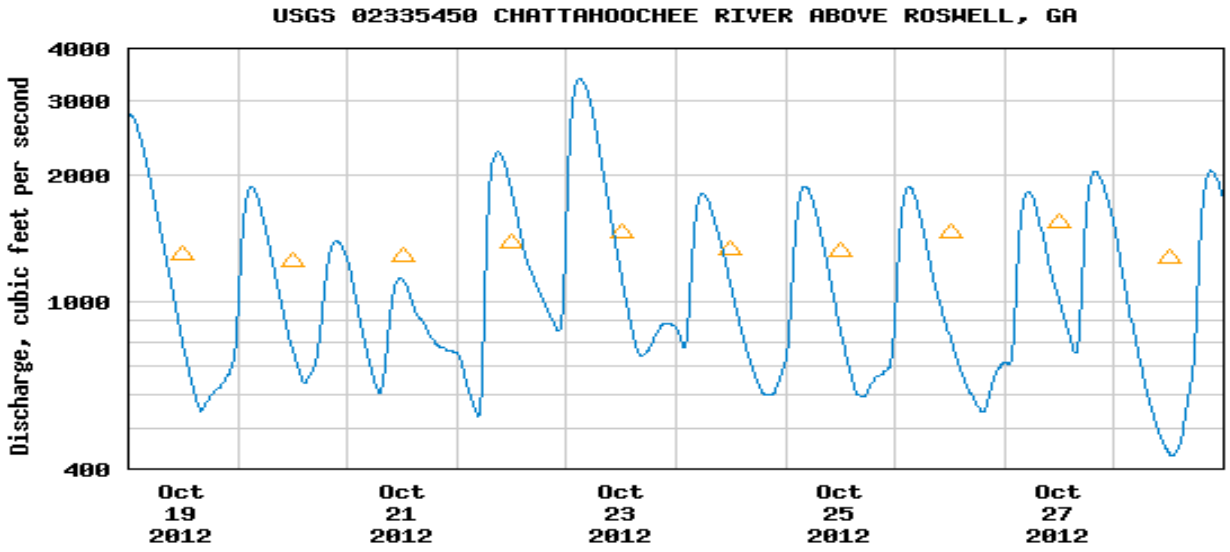


Figure 2b. At Roswell discharge at 1,115 cfs average = 10 cycles from 600 cfs to over 1,500 cfs 10/19 - 10/28/2012 (USGS 2335450)



- **The Chattahoochee experiences hourly increases of up to 5:1 in current flow (discharge) over 20 miles downstream of Buford Dam, increasing risks to wading fishermen, rowers and other recreational users.**

Figure 3. Turbidity at Norcross for average flow of 1,170 cfs 10/19 - 10/28/2012

Figure 3a. Norcross discharge at 1,170 cfs average discharge 10/19 -10/28/2012 (USGS 2335000)

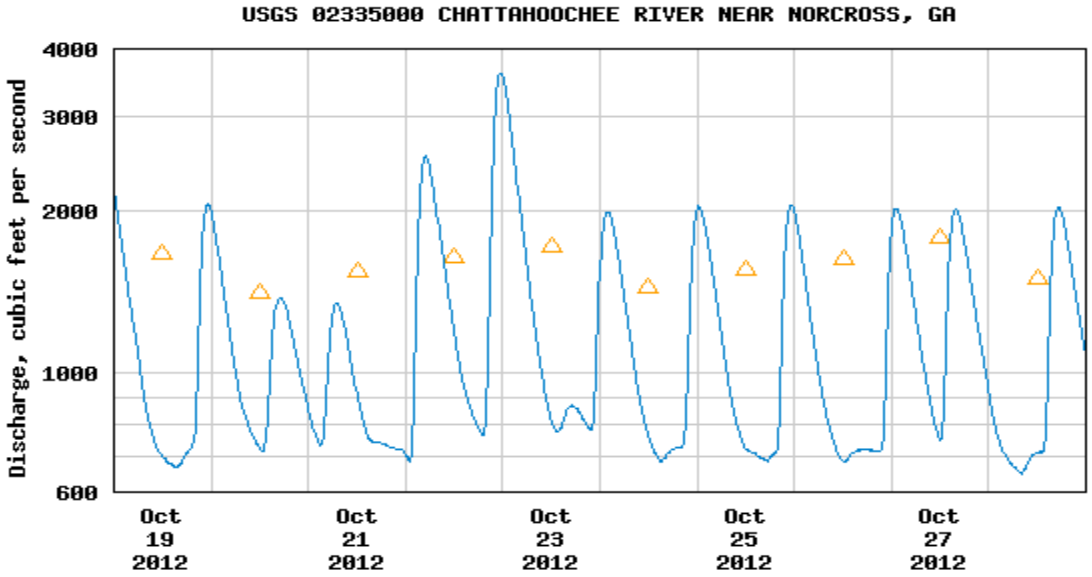
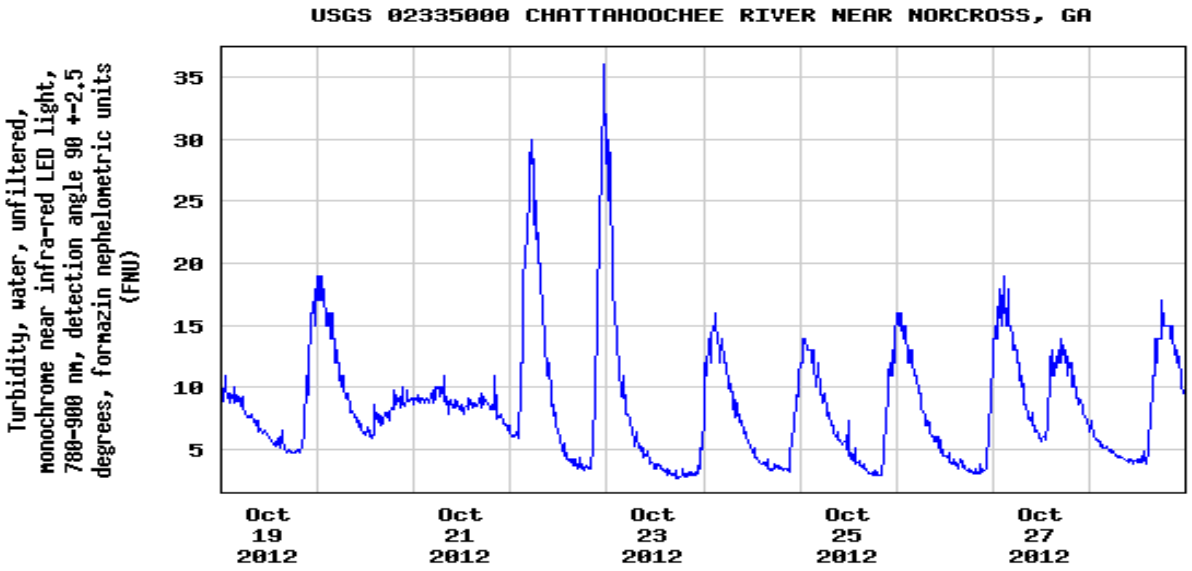


Figure 3b. Norcross turbidity at 1,170 cfs average discharge 10/19 - 10/28/2012 (USGS 2335000)



- **Turbidity peaks at Norcross increase as expected when discharge rate peaks above the 1,170 cfs average rate.**
- **Observations are summarized in Table 3.**
- **Measured rainfall was zero for the 10 day sample period.**

Figure 4. Turbidity at Norcross for average flow of 2,320 cfs 11/16 - 11/25/2012

Figure 4a. Norcross discharge at 2,320 cfs average discharge 11/16 - 11/25/2012 (USGS 2335000)

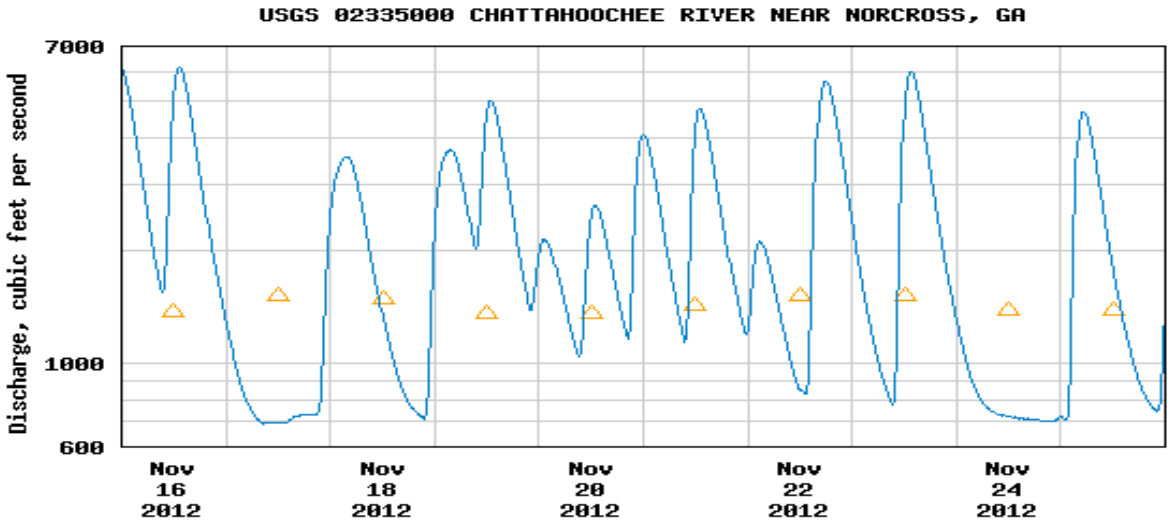
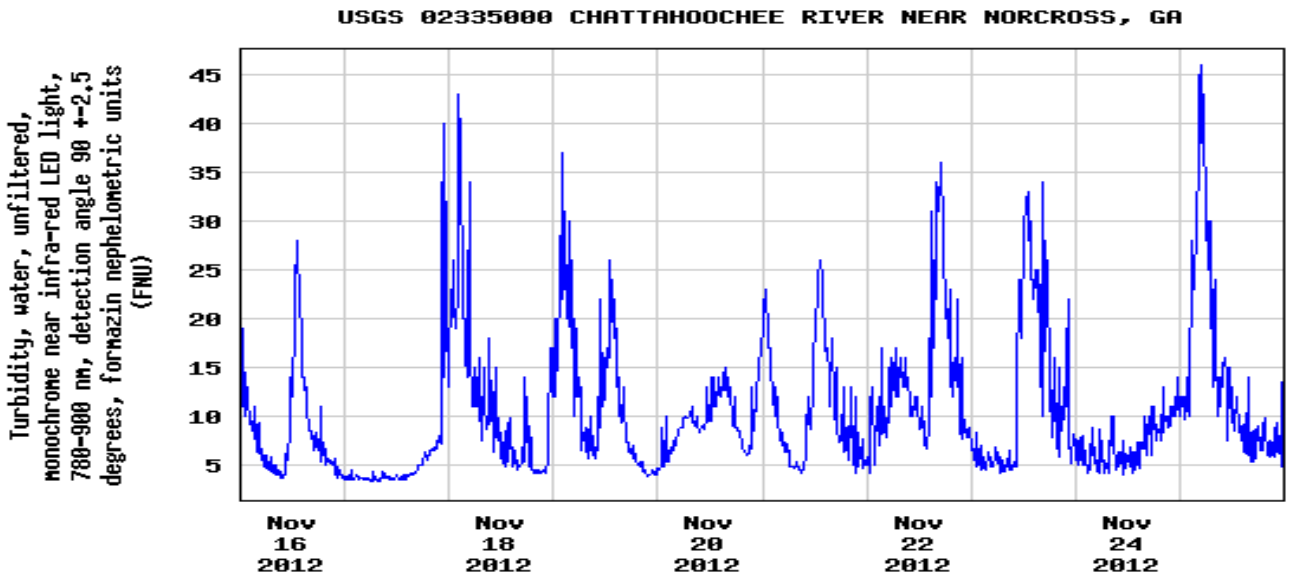


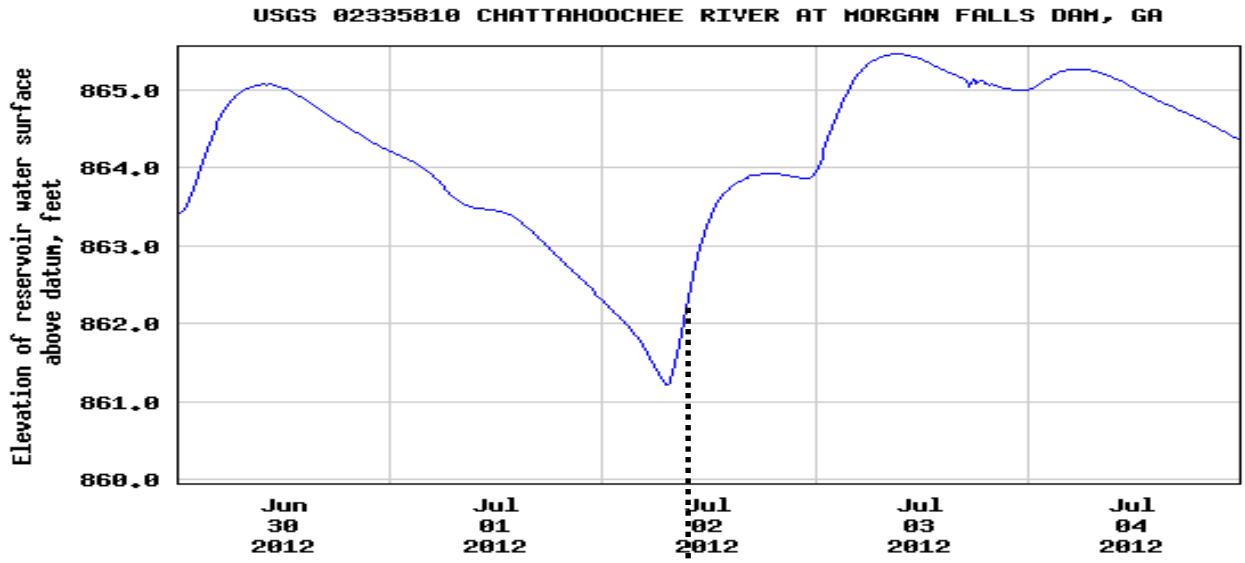
Figure 4b. Norcross turbidity at 2,320 cfs average discharge 11/16 - 11/25/2012 (USGS 2335000)



- **The peaking turbidity levels at Norcross increase dramatically as the average discharge rate increases from 1,170 cfs (Figure 3) to 2,320 cfs.**
- **The turbidity peaks are much higher and more frequent than at 1,170 average cfs.**
- **Observations are summarized in Table 3.**
- **Measured rainfall was zero for the 10 day sample period.**

Figure 5. Chattahoochee River Exposed Sandbar and Morgan Falls Dam Water Level (elevation) 6/30 - 7/4/2012 (USGS 2335810).

Elevation of reservoir water surface above datum, feet (USGS 2335810)



Exposed sandbar 500 yards down steam from Azalea Drive River Park, 9 AM July 2, 2012.

- **Morgan Falls levels (elevation) often cycle 6 feet around the average of 865 feet.**
- **Bull Sluice Lake levels affect conditions over 6 miles upstream.**
- **This exposed sandbar is one of several that span 50% of the river width between GA400 and Bull Sluice Lake.**

Figure 6. Effect of Buford Dam discharges on Bull Sluice Lake water levels 10/19 - 10/28/2012

Figure 6a. Discharge - Buford Dam 10/19 - 10/28/2012 (USGS 2334430)

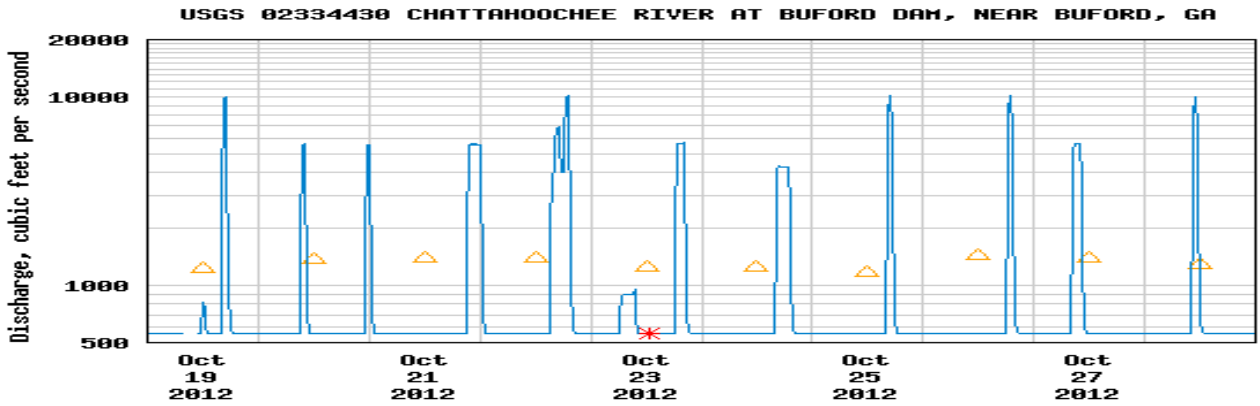


Figure 6b. Discharge - Morgan Falls Dam 10/19 - 10/28/2012 (USGS 2335815)

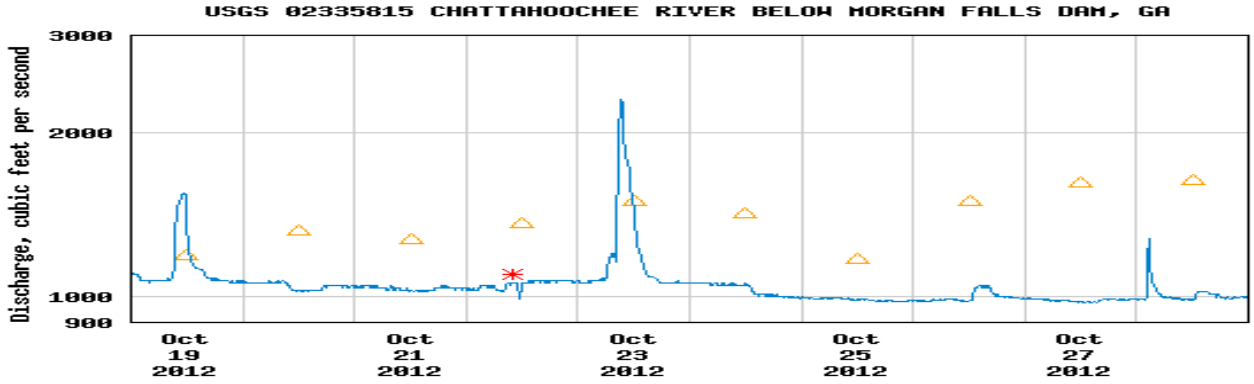
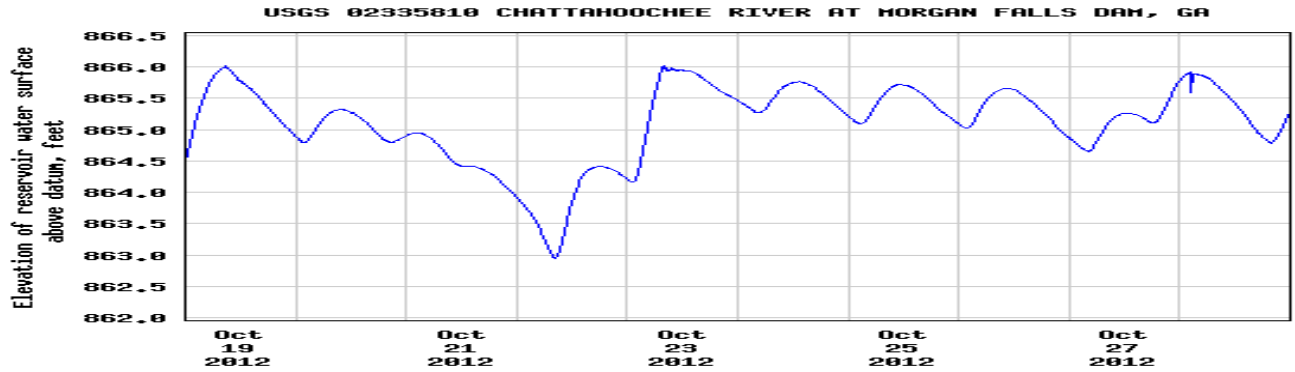


Figure 6c. Elevation - Chattahoochee at Morgan Falls Dam 10/19 - 10/28/2012 (USGS 2335810)



- **Morgan Falls operations manage a controlled discharge pattern to re-regulate the Buford Dam discharges.**
- **The peak levels of Buford Dam discharges cause dramatic level changes in the Chattahoochee River at Morgan Falls Dam and over 6 miles upstream.**
- **Measured rainfall was zero for the 10 day sample period.**

Table 1. Upper Chattahoochee turbidity study – List of turbidity study data sets (Faye 1980)

Chattahoochee River near Leaf	Soque River near Clarkesville
Chestatee River near Dahlonega	Big Creek near Alpharetta (1)
Big Creek near Alpharetta (2)	Chattahoochee River at Atlanta (3)
Chattahoochee River at Atlanta (4)	N. Fork Peachtree Creek near Atlanta
S. Fork Peachtree Creek at Atlanta	Peachtree Creek at Atlanta
Woodal Creek at Atlanta	Nancy Creek tributary near Chamblee
Nancy Creek at Atlanta	Proctor Creek at Atlanta
Chattahoochee River near Fairburn (4)	Snake Creek near Whitesburg
Chattahoochee River near Whitesburg (4)	

(1) rise (2) peak and recession (3) regulated flow (4) intervening runoff

Table 2. Indexed calculations of suspended sediment for a base discharge of 1,140 cfs using the average regression constants of the 14 data sets (Faye 1980)

Buford Dam Discharge Rate	Discharge Indexed %	Suspended Sediment, Indexed %	**Case 1**: Indexed suspended sediment using weighted 600 and 10,000 cfs cycles, % mg/L	**Case 2**: Indexed suspended sediment using weighted 600 and 3,000 cfs cycles, % mg/L
600 cfs	52%	47%		
1,140 cfs	100%	100%		
3,000 cfs	160%	200%		106%
10,000 cfs	770%	1,120%	116%	

Indexed suspended sediment = % Suspended Sediment at % Flow X % Time at the Case discharge rates.

Table 3. Summary of turbidity changes at Norcross for 10 day intervals (USGS 2335000). Timeframes were selected for zero rainfall (See Figures 3 and 4)

Timeframe 2012	Average discharge at Norcross	Discharge Peaks > 3,000 cfs	Turbidity Peaks > 15 FNU	Turbidity Peaks > 25 FNU	Number of Buford Dam discharge peaks ≥ 10,000 cfs
Oct 19 - 28	1,170 cfs	1	7	2	5
Nov 16 - 25	2,230 cfs	7	14	10	8

Table 4. Buford Dam Peak Discharge Timing 6/23 – 7/6/2012 (USGS 2334430)

Date	Day	Peak Discharge Timing	Discharge Peak, cfs	Discharge for Full On-Peak Load Time	Discharge for Partial On-Peak Load Time	Discharge at Off-Peak Load Time	Weekday Discharge at Off-Peak Load Time
6/23	Sat	No Discharge	--			**	
6/24	Sun	14:00 - 17:00	6,000		X		
6/25	Mon	15:00 - 18:00	10,700		X		
6/26	Tues	16:00 - 18:00	6,000		X		
6/27	Wed	13:00 - 15:00	4,000			X	X
		16:00 - 18:00	5,000		X		
6/28	Thurs	15:00 - 18:00	4,500		X		
6/29	Fri	14:00 - 18:00	6,000		X		
6/30	Sat	20:00 - 22:00	6,000			X	
7/1	Sun	20:00 - 23:00	6,000			X	
7/2	Mon	14:00 - 17:00	10,000		X		
7/3	Tues	13:00 - 15:00	6,000			X	X
7/4	Wed	21:00 – 23:59	6,000			X	X
7/5	Thurs	14:00 - 19:00	7,000	X			
7/6	Fri	14:00 - 19:00	5,500	X			
Total Weekday Discharge Hours				10	17	7	7

- **6/23-7/6 were the hottest consecutive 14 days in 2012**
- **The average daily elapsed time for all discharges was 3 hours. Weekday daily average was 3.4 hours.**
- **% Discharges that were during the typical 16:00 - 20:00 On-Peak demand times**
  - **18% of weekday discharges were during full 4 hours of On-Peak demand time**
  - **55% of weekday discharges were less than 4 hours of On-Peak demand time**
  - **27% of weekday discharges were during Off-Peak demand times**
  - **There was no discharge on 6/23**
  - **36% of all discharges were during Off-Peak demand times**

References

Chattanoogan (2012), 12,000 Expected for "Head Of The Hooch" This Weekend, *The CHATTANOOGAN.com*, 11/1/2012, Retrieved December 2012 from http://www.chattanoogan.com/2012/11/1/237665/12000-Expected-For-Head-Of-The-Hooch.aspx

USDI (2012), Atlanta's Chattahoochee River to become first national water trail of its kind. *United States Department of Interior Press Release 2/29/2012.* Retrieved November 2012 from http://www.doi.gov/news/pressreleases/New-National-Water-Trails-System-to-Promote-Healthy-Accessible-Rivers.cfm

GADNR (1997), Georgia Department Natural Resources Environmental Protection Division, Chattahoochee River Basin Management Plan 1997, Retrieved November 2012 from http://www.gaepd.org/Documents/chatt.html

KellerLynn (2012), KellerLynn, K., Geologic Resources Inventory Scoping Summary Chattahoochee River National Recreation Area Georgia, National Park Service, 10/31/2012, Retrieved December 2012 from http://www.nature.nps.gov/geology/inventory/publications/s_summaries/CHAT_GRI_scoping_summary_2012-1031.pdf

Chattahoochee Riverkeeper web (2012), Chattahoochee Riverkeeper web site, 10 Facts about the Chattahoochee River. Retrieved December 2012 from http://www.chattahoochee.org/river-facts.php

Southern Company (2006), Resource Study Report Water Resources Morgan Falls Project, March 2006 (FERC No. 2237) Southern Company Hydro Services and GEOSYNTEC CONSULTANTS), Retrieved November 2012 from www.georgiapower.com/docs/about-energy/Water_Resources_Report.pdf

Green (2011), Green J., Chattahoochee River Deaths: Are strict rules the answer?, *Gwinnett Daily Post*, Retrieved November 2012 from http://www.gwinnettdailypost.com/news/2011/jun/11/chattahoochee-river-deaths-are-strict-rules-the/?news

Coghlin (2011), Coghlin L., United States Army Corps of Engineers, *Sandy Springs Patch*, July 1, 2011, Retrieved November 2012 from http://sandysprings.patch.com/articles/chattahoochee-can-turn-dangerous-quickly-4

Faye (1980), Faye R. E., Carey W. P. Stamer J. K., Klecker R. L., U S Department of Interior Geological Survey Professional Paper 1107; Erosion, Sediment Discharge, and Channel Morphology in the Upper Chattahoochee River Basin, Georgia, Retrieved November 2012 from http://pubs.usgs.gov/pp/1107/report.pdf

GA Power-1 (2006), Georgia Power Resource Study Report Geology and Soils, 3/2006, Retrieved November 2012 from http://www.georgiapower.com/docs/about-energy/gs1of7.pdf

GA Power-2 (2004), Georgia Power Morgan Falls Hydro, Pre-Application Document, 2004, Retrieved November 2012 from http://www.georgiapower.com/docs/about-energy/MorganFallsPAD.pdf

US EPA (2012), US EPA, Rivers and Streams Monitoring and Assessment, 3/6/2012, Section 5.5 Turbidity Retrieved November 2012 from http://water.epa.gov/type/rsl/monitoring/vms55.cfm

Klein (2003), Klein L., Investigation of the Trout Fishery in the Chattahoochee River Below Buford Dam, Georgia Department of Natural Resources, January 2003, Retrieved November 2012 from http://outdoorrecreationdata.com/Stats/GA_TroutInvestigation_03.pdf

GA Power-3 (2004), Georgia Power Morgan Falls Hydro Operations Primer 9/2004, Retrieved November 2012 from http://www.georgiapower.com/docs/about-energy/OperationsPrimer.pdf

State of Oregon (2010), State of Oregon Dept of Environmental Quality Turbidity Technical Review 9/7/2010 Retrieved November 2012 from www.deq.state.or.us/wq/standards/docs/Turbidity/10-WQ-022.pdf

Georgia EPA (2000), Georgia Environmental Protection Division Guidance Manual for Preparing Public Water Supply System O & M Plans, 3/2000, Retrieved November 2012 from www.gaepd.org/Files_PDF/techguide/wpb/o&m.pdf

SEPA web, Southeastern Power Authority web page, Retrieved November 2012 from http://www.sepa.doe.gov/Operations/?c=19

USACE (2012), USACE, Apalachicola-Chattahoochee-Flint (ACF) Remand Hydropower Study 4/2012 The Hydropower Analysis Center For Mobile District USACE, Retrieved December 2012 from http://www.sam.usace.army.mil/Portals/46/docs/planning_environmental/acf/docs/2012ACF_hydropowerstudy.pdf

Robbins (2012), Robbins, P., USACE, Rowers have trouble keeping pace with Chattahoochee's hurdles, *Atlanta Journal Constitution*, Retrieved November 2012 from http://www.ajc.com/news/news/local/rowers-have-trouble-keeping-pace-with-chattahooche/nQW32/

Southern Company web, Southern Company web page, Retrieved November 2012 from http://www.southerncompany.com/southernpower/pdfs/SP_fact_sheet_Dahlberg.pdf

Water Management Alternatives Form #33

Name *	Wilton Rooks
Which Caucus do you represent?	Upper Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	• Water Quality • Water Supply • Farm Agriculture • Industry & Manufacturing • Hydro Power • Thermal Power • Environment & Conservation • Urban Agriculture
Email *	wilton@rooks.us
Phone Number	(678) 696-0404
1. Changes to Water Use	Reduce water consumptive use by 25% across all water users.
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Columbia • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff • Chattahoochee • Blountstown • Sumatra
2. Changes to Water Returns	Increase water returns to support less consumptive use goal of 25% reduction of consumptive use.
If known, check the primary node	• Lake Lanier

locations that apply	• Norcross • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge • Woodruff
3. Changes to Storage	Manage Lake Lanier to achieve a 2 feet increase in the conservation pool year round and increase the conservation pool at West Point to achieve an increase in winter storage levels by 4 feet.
If known, check the primary node locations that apply	• Lake Lanier • West Point Lake
4. Changes to Lake Operations	Change reservor operations to follow the 'Georgia Contemplations' management provisions and/or a plan designed and evaluated by the Georgia Water Resource Institute as alternatives to the USACE RIOP.
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Columbia

Key Alternative Assumptions

The goal of this WMA is to determine the effect of combining changes that are 'reasonably' achievable. The assumption is that the current zone structure of the reservor management would be replaced by the management provisions in the Georgia Contemplations and/or by a plan designed by GWRI (if any). The assumption is that if the results show significant improvement in the water availability then the USACE would be willing to consider adopting it.The water consumptive goal of 25% reduction could be achieved by reduced water withdrawals and/or increased water returns. The modelers could decided which of these (reduced withdrawals or increased returns) would make the most sense at each node.

Measure of Success:	Meeting the water supply requirements for population centers, Increased lake levels and increased flow at the state line over broad range of hydrological conditions.

	A measure of success would also be to improve the environmental goals for the total basin.
Legal / Public Policy Considerations:	Water policies would have to be put in place to require or incentivize adherence to water consumptive goals.
Implementation Risk / Uncertainty:	Plan would require acceptance of USACE to revised reservoir operational rules and conditions
Cost?	The water conservation goal will possible require costs to correct interbasin transfers and more efficient use of water by all water users.
Other Information	If this WMA works then it could be the basis for a consensus recommendation – hopefully...

Attach a File?

Created 2 May 2013 10:50:51 AM	76.97.200.49 IP Address	Updated 2 May 2013 11:17:36 AM
PUBLIC		PUBLIC

Complete

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #1a

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use: ***NONE***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

Rule curve and reservoir balancing operations for the four Corps ACF projects is replaced by a simplified regime of reservoir releases whereby water is released from an upstream project to prevent the downstream reservoir from falling below a single specified target elevation. Releases are also made to meet local (immediately downstream) minimum instream flow targets and water supply requirements. Hydropower operations are purely incidental and conjunctive to other releases. RIOP release requirements from the Woodruff project remain the same.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Based upon extensive modeling, the following target elevations were found to provide maximum benefit to the largest set of basinwide performance measures:

West Point – 622 feet
Walter F. George – 185 feet
Jim Woodruff – 75.9 feet

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

***This Water Management Alternative would replace current system operations as defined by the current ACF Water Control Manual (WCM) and Revised Interim Operating Plan (RIOP) and would need to be fully vetted by the U.S. Army Corps of Engineers*.**

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Potential loss in hydropower revenue. This could be addressed by incorporating a regime for hydropower releases similar to WMA Haubner #2.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Previous modeling results from our analyses can be provided to the ACFS modeling team upon request.

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #1b

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use: ***NONE***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

   Rule curve and reservoir balancing operations for the four Corps ACF projects is replaced by an alternative operations and management scheme as defined by a systems optimization performed by the Georgia Water Resources Institute (GWRI) Decision Support System (DSS) model.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

***This Water Management Alternative would replace current system operations as defined by the current ACF Water Control Manual (WCM) and Revised Interim Operating Plan (RIOP) and would need to be fully vetted by the U.S. Army Corps of Engineers*.**

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Dependent on the nature of the proposed operational changes and regime.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Dependent on the nature of the proposed operational changes and regime.

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #2

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use: ***NONE***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

   Specific "power generation zones" are defined for the Buford, West Point and W.F. George projects. Hydropower generation under the WCM/RIOP operations is performed under the following rules:

   - ***In power zone 1, releases for 3 hours of generation are made on weekdays***
   - ***In power zone 2, releases for 3 hours of generation are made on weekdays only when the peak energy price is "high" (mean temperature < 40 degrees or >= 80 degrees F)***
   - ***Below power zone 2, hydropower generation is incidental and conjuction with other uses***

   All other ACF basin operations under the WCM/RIOP remain the same.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

A time series of energy prices would be required to develop the optimal power zone rule curve elevations. If this price information is not available, a temperature surrogate (as provided in the proposed rules above) could be used.

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

***This Water Management Alternative would replace current system operations as defined by the current ACF Water Control Manual (WCM) and Revised Interim Operating Plan (RIOP) and would need to be fully vetted by the U.S. Army Corps of Engineers*.**

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers.

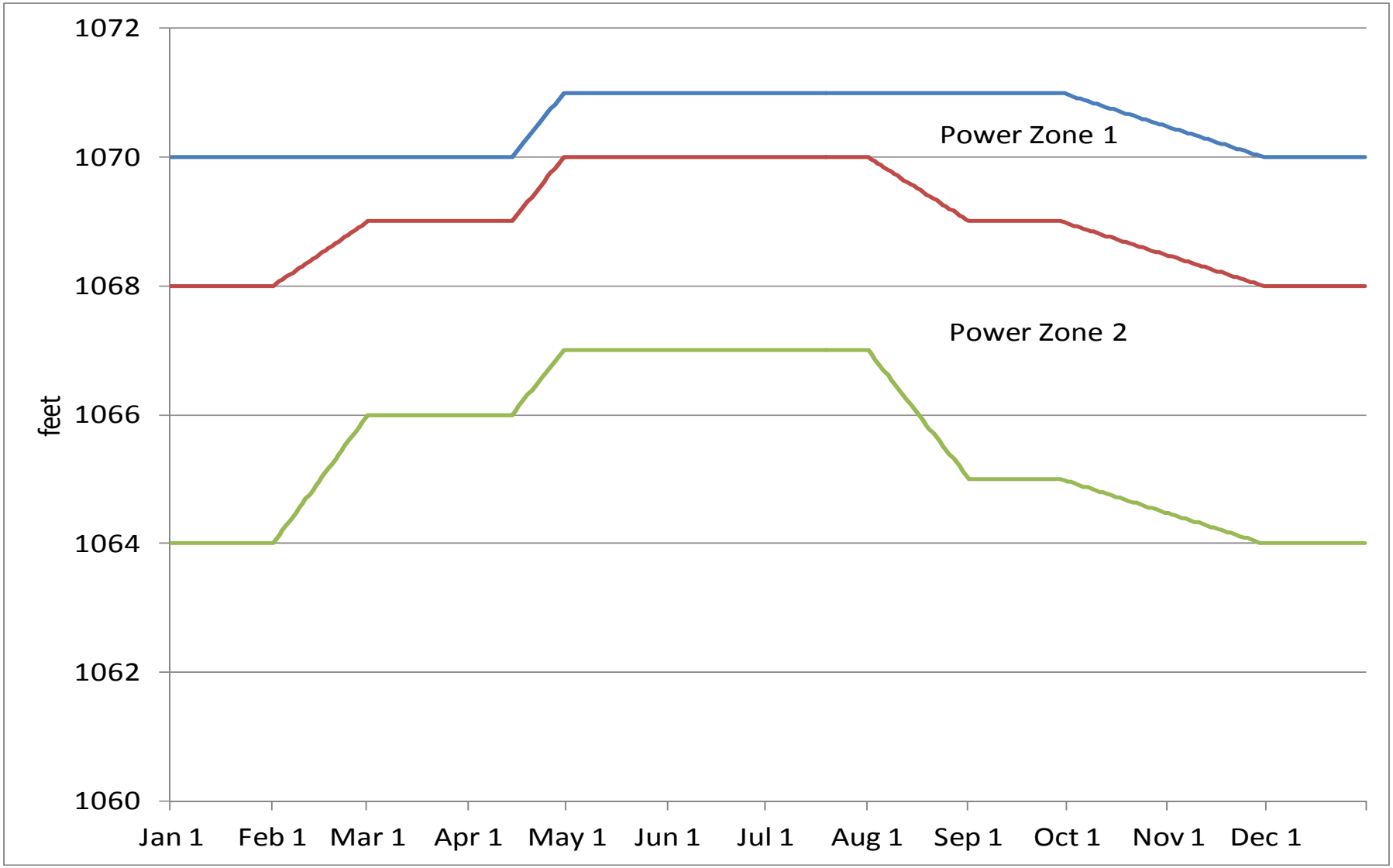
Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Minor loss in hydropower revenue.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

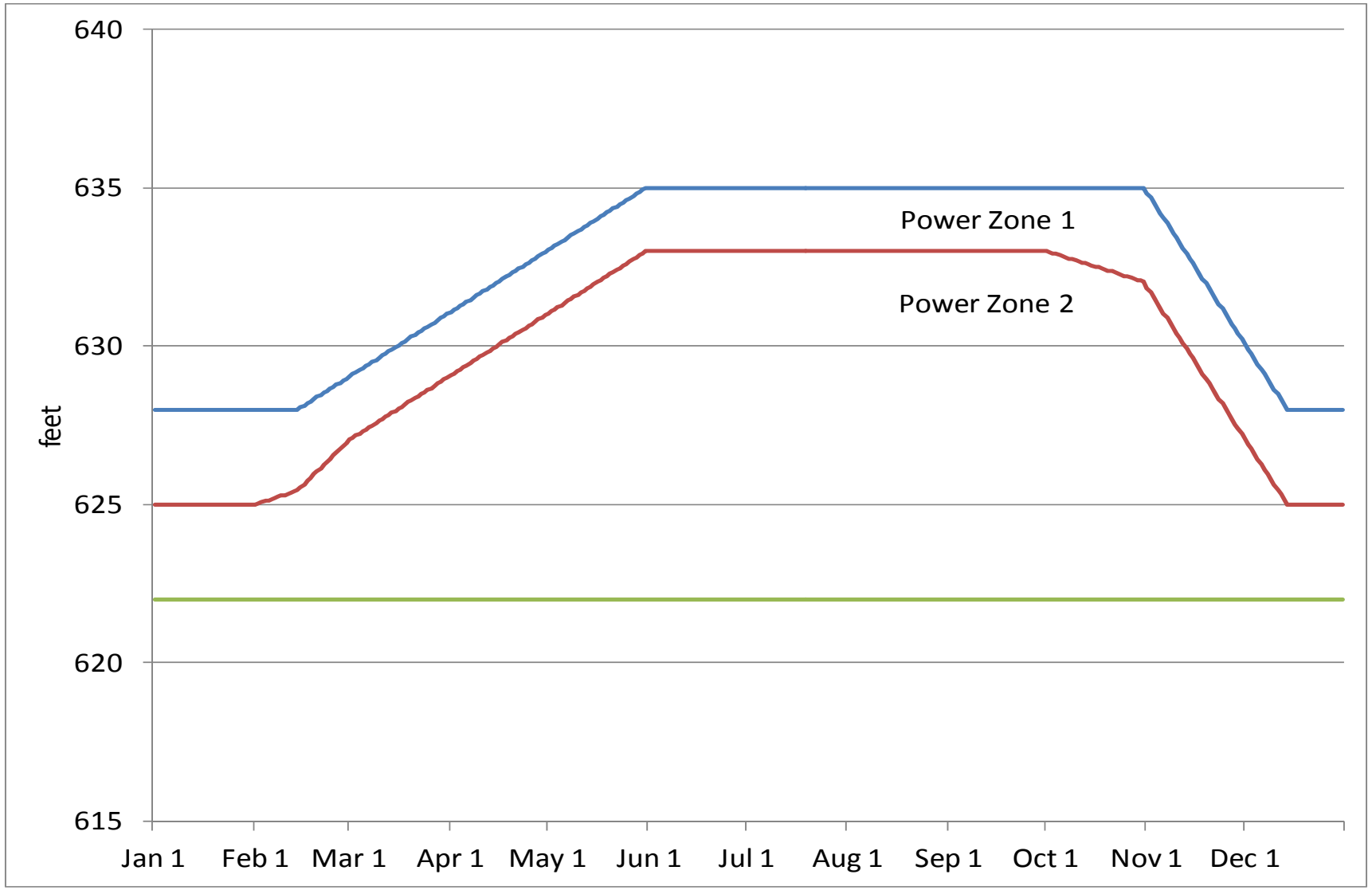
Please see the attached power generation zone charts for Lake Lanier, West Point and W.F. George. These are optimized rule curves from our modeling work and analyses which can be provided to the ACFS modeling team upon request.

Lake Lanier Power Zones

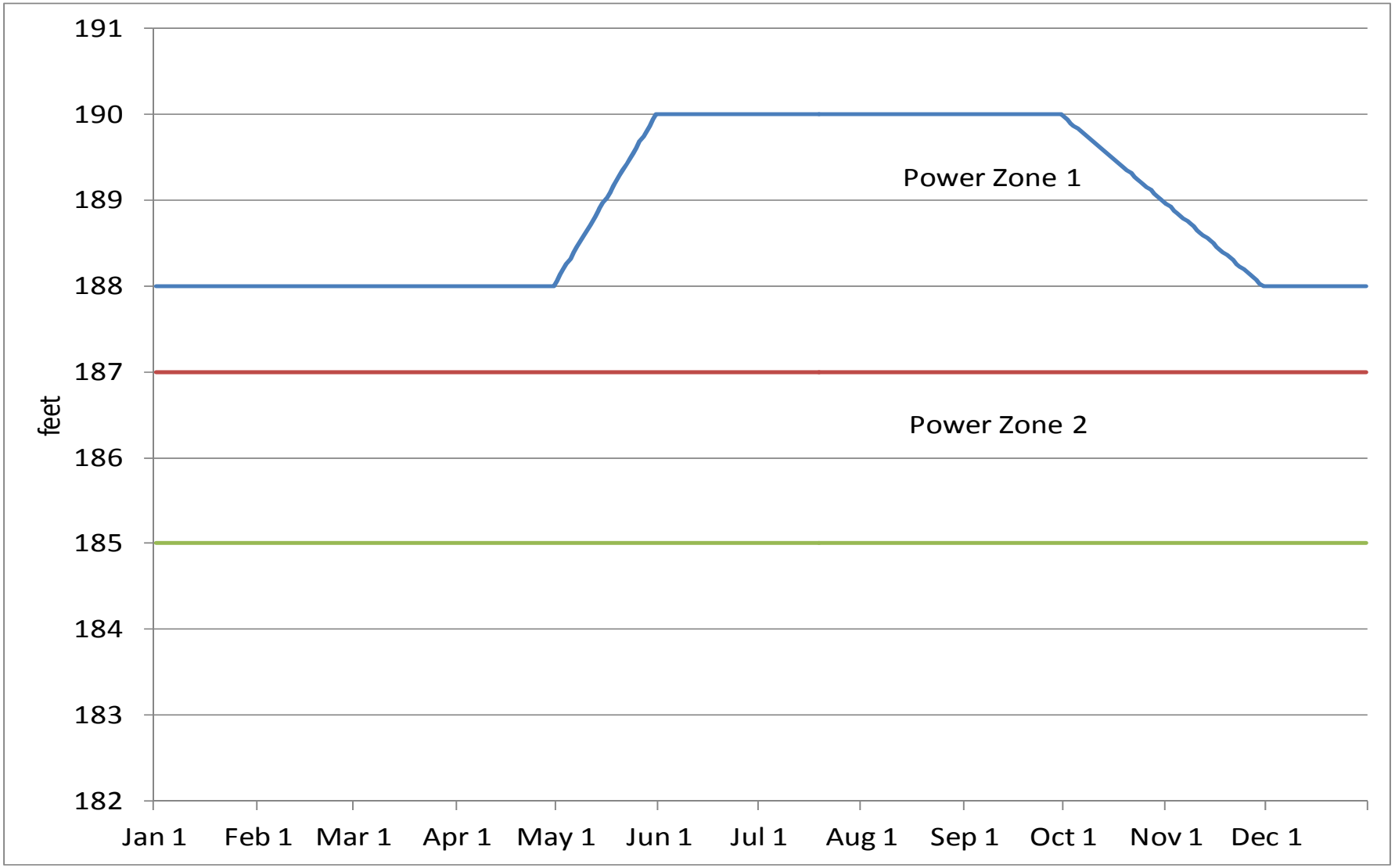


Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

West Point Power Zones



WF George Power Zones



Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #3

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use: ***NONE***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

   Replace current RIOP release rules at Woodruff Dam with a flow regime designed to target the highest amount of sustainable spawning habitat, the best availability of sustainable floodplain connectivity, maximal amount of mussel habitat and the most economic use of system storage. These release rules and flow regime should include the ability to provide flow pulses to mimic natural flow variability and reduce flow flatlining.

   All other ACF basin operations under the WCM/RIOP remain the same, including current reservoir action zones.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

In the formulation of these release rules, we used performance measures designed by U.S. Fish and Wildlife Service (FWS) in the BiOp for Gulf sturgeon spawning and Apalachicola River flood plain connectivity. Other things being equal, FWS considers the operational alternative that provides the highest amount of habitat availability to be the best one. Without making any judgment as to the soundness of that assumption, we assumed, for the purpose of this analysis, that more habitat would be preferable.

We also conducted extensive data analyses to obtain information on potential fat three-ridge mussel habitat in the Apalachicola River. These analyses resulted in a suggestion to FWS that it use direct mussel habitat performance measures instead of the surrogates

that FWS has used thus far. Without making any judgment as to the amount of habitat needed, for the purpose of this analysis, we assumed that the alternative that provides more mussel habitat would be considered a better option.

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

***This Water Management Alternative would replace current system operations as defined by the current ACF Water Control Manual (WCM) and Revised Interim Operating Plan (RIOP) and would need to be fully vetted by both the U.S. Army Corps of Engineers and U.S. Fish and Wildlife Service*.**

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

No apparent costs.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Please see the attached rules for Jim Woodruff flow target and release rules. These are optimized release rules from our modeling work and analyses which can be provided to the ACFS modeling team upon request.

Table 1 - **State Line Flow and Storage Formula**				
Months	**Total Storage in Reservoirs**	**Basin Inflow (BI) (cubic feet/second) or Other Conditions**	**State Line Flow (SLF) (cubic feet/second)**	**Basin Inflow to be Stored[2] (cubic feet/second)**
March	Zones 1, 2, and 3	NA	>=6,500 cfs	Entire or partial BI above SLF, subject to available Storage Capacity[3]
April 1 – May 31	Zones 1, 2, and 3	Cumulative BI in February and March > 2.45 million acre-feet	Maintain Q = min (10,500 cfs, min(observed moving 30-day flow))	Entire or partial BI above SLF, subject to available Storage Capacity
		Otherwise if BI > = 10,500 If BI < 10,500 and >= 5,000 If BI < 5,000	>= 10,500 >= BI >= 5,000	
In sub-period April 16 – April 30		Lanier > 1066', and West Point > 632', and Walter F. George > 187'	Maintain Q = min (22,500 cfs, max(10,500, min(observed March 17 – April 15 daily flow)))	Entire or partial BI above SLF, subject to available Storage Capacity
June - Nov	Zones 1, 2, and 3	BI>= 10476 & previous seven days' Chattahoochee gage flow <5100	>= High Pulse flow (June 14850, July 15500, August 14400, September 11200, October 10100, November 10500), No rise & fall rate limit.	Entire or partial BI above SLF, subject to available Storage Capacity
		BI>= 7181 and < 10476 & previous seven days' Chattahoochee gage flow <5100	>= Small Pulse flow (June 11600, July 11500, August 11100, September 8620, October 7420, November 7980), No rise & fall rate limit.	Entire or partial BI above SLF, subject to available Storage Capacity
		Other situation	>= 5,000	Entire or partial BI above 5,000 cfs, subject to available Storage Capacity
Dec - Feb	Zones 1, 2, and 3	NA	>= 5,000	Entire or partial BI above 5,000 cfs, subject to available Storage Capacity
At all times	Zone 4	NA	>= 5,000	Entire or partial BI above 5,000 cfs, subject to available Storage Capacity
At all times	Drought Zone	NA	>= 4,500	Entire or partial BI above 4,500 cfs, subject to available Storage Capacity

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #4

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use: ***NONE***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

   Utilize forecast-based operating rules including climate ensemble forecasts to set real-time variable targets for flows and federal project releases throughout the ACF system. When combined with storage levels, forecasts can be used to determine the appropriate levels of flow support from storage. This will allow better performance for hydropower, water supply, recreation, environmental flow, navigation and other project/water management purposes.

   This Water Management Alternative could be combined or considering in parallel with the GWRI DSS system optimization proposed in WMA Haubner #1b.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Operating rules that use forecasts should be evaluated using hindcasts and simulation modeling.

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

***This Water Management Alternative would replace current system operations as defined by the current ACF Water Control Manual (WCM) and Revised Interim Operating Plan (RIOP) and would need to be fully vetted by the U.S. Army Corps of Engineers*.**

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Dependent on the nature of the proposed operational changes and regime.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Dependent on the nature of the proposed operational changes and regime.

ACF Stakeholders Water Management Alternative Submittal – HAUBNER #5

Contact Information: Contact Name: ***Steve Haubner***
Which Caucus do you represent? ***Upper Chattahoochee***
Alternative address of one or more of the following stakeholder interests? **All**
Telephone Number: ***404-463-3257*** E-mail Address: ***shaubner@atlantaregional.com***

Alternative Description
Describe your alternative by providing information in the following four categories.

1. Changes to Water Use:

   Structural alternatives to reduce ACF project release requirements and downstream demands in the lower Chattahoochee River and Apalachicola River systems.

   These structural alternatives include:

   A. ***Renovation of Jim Woodruff Dam in order to reduce unnecessary releases necessitated by head limits due to structural integrity issues with the dam.***
   B. ***Refurbishing the intake at Alabama Power's Plant Farley to allow the facility to meet water demand requirement at lower river flows.***
   C. ***Restoring the river channel below Woodruff Dam on the Apalachicola River in Florida to address entrenchment issues and requirements for floodplain inundation.***
   D. ***Either closing or installing a lock at Sikes Cut on Apalachicola Bay in order to address salinity impacts on the Bay.***

2. Changes to Water Returns: ***NONE***

3. Changes to Storage: ***NONE***

4. Changes to Lake Operations:

   Changes to ACF project operations based on addressing the net benefits to project & system storage and reduced water demands provided by structural alternatives A, B, C and/or D, to be consistent with environmental flow requirements as specified by the current RIOP or other alternate environmental flow regime.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Each of the proposed structural alternatives will result in a decreased need in water demand and releases from upstream projects in the ACF system.

Additional Information

Measure of Success:

Evaluation of key performance metrics including ACF project lake levels, recreation impacts, instream environmental flows, water supply shortages, navigation windows, Apalachicola Bay conditions and FWS ACF BiOp performance criteria.

Legal / Public Policy Considerations:

Would require consideration and implementation by the U.S. Army Corps of Engineers, the State of Florida and Alabama Power, respectively.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Would require consideration and implementation by the U.S. Army Corps of Engineers, the State of Florida and Alabama Power, respectively.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Capital and any ongoing operation and maintenance costs of the structural improvements A, B, C and/or D.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Additional information is available from several sources on the costs and potential benefits of these structural alternatives.

Water Management Alternatives Form #35

Name *	Dan Tonsmeire
Which Caucus do you represent?	Apalachicola
Performance Metrics will relate to which Stakeholder Interest categories?	• Navigation • Recreation • Water Quality • Water Supply • Farm Agriculture • Industry & Manufacturing • Seafood Industry • Hydro Power • Thermal Power • Local Government • Environment & Conservation • Business & Economic Development • Historic & Cultural • Urban Agriculture
Email *	dan@apalachicolariverkeeper.org
Phone Number	(850) 508-7787
1. Changes to Water Use	Limit Consumptive Water Depletions (all consumptive use – returns-evaporation) in the basin to 6% of UIF flow at the Chattahoochee gage on a daily, weekly, or monthly basis.
If known, check the primary node locations that apply	• Woodruff • Chattahoochee • Blountstown • Sumatra
2. Changes to Water Returns	Part of Item 1 above.
If known, check the primary node locations that apply	
3. Changes to Storage	Use run of river as baseline and store water when flow loss does not exceed 6% loss of flow at the Chattahoochee gage.
If known, check the primary node locations that apply	
4. Changes to Lake Operations	run of river operations with storage of higher flows in the reservoirs during flow loss does not exceed the 6% loss of flow at Woodruff/Chattahoochee gage.

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

If known, check the primary node locations that apply	• Woodruff • Chattahoochee • Blountstown • Sumatra
Key Alternative Assumptions	Ability to work backwards from UIF Run of River flows and ascertain the flows available for storage (less than the 6% loss) and convert those into water available for consumptive use of all kinds. Then sort out the percentage of use between the Flint and Chattahoochee Rivers and the percentage of consumptive uses between ag, municipal and industrial users on those respective river systems based on a total volume of water that can be used and still maintain the flows at the Chattahoochee gage at or above a 6% loss..
Measure of Success:	Meeting the UIF dry years pre dam flows less 6%) based on run of river with evaporative losses with no greater than a 6% loss of flow at the Chattahoochee gage
Legal / Public Policy Considerations:	Set limits on water demands that will maintain healthy river system.
Implementation Risk / Uncertainty:	
Cost?	
Other Information	Flows will maintain healthy ecosystems and meet other instream needs and some consumptive uses
Attach a File?	

Created 10 May 2013 6:35:25 PM	75.224.17.250 IP Address	Updated 10 May 2013 7:03:40 PM
PUBLIC		PUBLIC

Complete

Water Management Alternatives Form #36

Name *	Brad Moore
Which Caucus do you represent?	Middle and Lower Chattahoochee
Performance Metrics will relate to which Stakeholder Interest categories?	
Email *	bmooreless@gosuto.com
Phone Number	
1. Changes to Water Use	
If known, check the primary node locations that apply	
2. Changes to Water Returns	
If known, check the primary node locations that apply	
3. Changes to Storage	
If known, check the primary node locations that apply	
4. Changes to Lake Operations	Using expert modeler opinion develop a revised optimum RIOP that maximizes stakeholder performance metrics. This optimized RIOP should utilize predictive drought forecasting to manage river flows and lake levels.
If known, check the primary node locations that apply	• Lake Lanier • Norcross • Morgan Falls • Atlanta • Whitesburg • West Point Lake • West Point Gage • Columbus • W. George • Columbia • Chattahoochee • Griffin • Carsonville • Montezuma • Albany • Bainbridge

Appproved for general release by the Governing Board of ACF Stakeholders, Inc.

- Woodruff
- Chattahoochee
- Blountstown
- Sumatra

Key Alternative Assumptions	Assume that USACE will allow use of predictive drought management in development of the RIOP.
Measure of Success:	as many stakeholder performance metrics as possible are maximized.
Legal / Public Policy Considerations:	RIOP must be implementable by the USACE.
Implementation Risk / Uncertainty:	
Cost?	
Other Information	Consider holding meetings with USACE to discuss use of drought management predictions in developing this revised RIOP. It is desired to submit this suggested WMA to the USACE by end of 2013.

Attach a File?

Created 21 May 2013 2:18:55 PM	147.182.5.150 IP Address	Updated 21 May 2013 2:21:14 PM
ACFS		ACFS

Complete

Water Management Alternatives Form #37

Name *	Gordon Rogers
Which Caucus do you represent?	Flint
Performance Metrics will relate to which Stakeholder Interest categories?	• Recreation • Water Supply • Farm Agriculture • Environment & Conservation
Email *	osbornerr@bv.com
Phone Number	
1. Changes to Water Use	e. "Move" an additional 20% of lower Flint ag withdrawals to deeper aquifers, those not having direct connection to surface flows. Model lower Flint ag withdrawals at 80%, 75%, and 70% of what they currently are (reductions of 20, 25, and 30%).
If known, check the primary node locations that apply	
2. Changes to Water Returns	Model upper Flint returns (Griffin, Carsonville, and Montezuma gauges) at double, and 3 times, what they currently are (this will equate to 50% and 75% returns, more in line with the Metro standard/bar).
If known, check the primary node locations that apply	
3. Changes to Storage	f. Utilize existing storage in upper Flint government reservoirs to supplement low flows: as a first modeling step add an aggregate of 10 cfs to baseflows at all times when flows at Carsonville drop below 75 cfs.
If known, check the primary node locations that apply	
4. Changes to Lake Operations	
If known, check the primary node locations that apply	

Key Alternative Assumptions

i. In the upper Flint, aggregate nominal storage in government reservoirs is slightly over 44,000 acre-feet (14.3 billion gallons); reference: GA EPD letter from Nolton Johnson to USACOE August 2001. The figures do not include reservoirs in Meriwether and Upson Counties, which would add to the total(s).
ii. Total summertime, drought-conditions use (withdrawals) in the Upper Flint is (are) difficult to calculate. Our first reference should be the inputs to the model we are currently using. Other references are the 2010 Metro District report, and American Rivers' "Running Dry" report.
iii. The above calculation needs to be compared to 2- and 3- year 'needs' for withdrawal from storage in the upper

Flint, as a reality check.

Measure of Success:

Legal / Public Policy Considerations:

Implementation Risk / Uncertainty:

Cost?

Other Information

Attach a File?

wma_ideas_gleaned_from_members_of_the_flint_caucus_5_1…
278.98 KB · PDF

Created		Updated
24 May 2013	74.171.140.84	24 May 2013
2:54:17 PM	IP Address	3:01:25 PM
ACFS		ACFS

Complete

WMAs and Related Items Extracted from the Shared Comments of ACFS Flint Caucus Members in Early May 2013

Note: Chairman Singletary solicited thoughts on flow issues in the Flint, solutions, prioritization of water use interests, flow-savings ideas, questions that need answering, and other thoughts, during early May of 2013. The following list only addresses WMAs and related items, "WMA ideas", and is unattributed in terms of who submitted them (other than it came from Flint Caucus members). The list is not meant to be exhaustive or completely explanatory; the list is merely one person's gleaning from a long series of emails. I may have mischaracterized or missed some items. With a little effort, each of these can be parameterized, some in a tiered or layered fashion, to form robust WMAs. At the end of the list is a first cut at parameterization. – Gordon Rogers 5/11/13.

Please consider:

1) Moving well-supplied residential and business properties in key portions of the upper Flint Metro suburbs to surface water sources.
2) Attaching as many septic-served residential and business properties as possible in key portions of the upper Flint Metro suburbs to direct-return (NPDES) waste treatment systems.
3) Expanding drip irrigation to vast acreages.
4) Shading, on a landscape scale, surface water agricultural impoundments. Expansion of solar arrays offers this opportunity.
5) Raising storage pool in Lanier by two feet.
6) Raising storage pool in West Point by (X?) feet.
7) Restoring the channel of the Flint, below Albany, to historic grade (blasted for navigation in the 1800s). Is there an opportunity here, hydrologically?
8) Including Florida ag withdrawals from the ACF in all modeling of WMAs.
9) Requiring native/xeric landscaping in Metro (in particular, the SW Metro suburbs of the upper Flint). If not the landscaping per se, limit water use and leave landscaping as a choice to landowners/managers. Currently, many jurisdictions and properties actually require wasteful packages/arrays of plants and turfs. Reverse this. Perhaps use incentives as well as regulatory rubrics.
10) Revising withdrawal permits in the upper Flint.
    a. Include M&I in the current (ag) moratorium, basinwide (cap usage).
    b. Include upper Flint "ag" (some actually is ag, some is urban ag (nurseries), some are golf courses) in the management regimen.
    c. Roll back (remove, surrender) unused volumes from permits.
    d. Revisit the permits every 10 years.
    e. Examine cutoff tiers for low-flow periods.
11) Reversing the IBTs
    a. Clayton County
    b. Coweta County
    c. Spalding County

12) Expanding the Flint River Drought Protection Act to the entire Flint: not only ag in the lower Flint, but all permit types (ag, M, & I) throughout the entire basin. All permit types and areas of the Flint should participate in drought-management requirements.
13) Moving the jurisdictions in the upper Flint that have NOT complied with the Metro District's conservation guidelines into compliance.
14) Utilize existing storage in the upper Flint to supplement flows during low-flow periods.

Here is an initial cut at the distillation of these into quantifiable WMA's. This does NOT adequately quantify ALL of the above ideas, just those that Rogers felt competent to take a swipe at, and even then they may not be adequately described !! :

a. Model upper Flint IBT returns at 9, 12, and 18mgd average daily flow (13, 18, and 27 cfs)
b. Model upper Flint summertime mainstem withdrawals at
    i. Zero when flows at Griffin are below 40 cfs and/or flows at Carsonville are below 85 cfs
    ii. Zero when flows at Griffin have been below 100 cfs for more than 100 days (regardless of actual instantaneous discharge) and/or flows at Carsonville have been below 300 cfs for more than 100 days (regardless of actual instantaneous discharge).
c. Model upper Flint returns (Griffin, Carsonville, and Montezuma gauges) at double, and 3 times, what they currently are (this will equate to 50% and 75% returns, more in line with the Metro standard/bar).
d. Model lower Flint ag withdrawals at 80%, 75%, and 70% of what they currently are (reductions of 20, 25, and 30%).
e. "Move" an additional 20% of lower Flint ag withdrawals to deeper aquifers, those not having direct connection to surface flows. Initially, do not distinguish among movements of surface and Floridan aquifer permits. This can wait until later.
f. Utilize existing storage in upper Flint government reservoirs to supplement low flows: as a first modeling step add an aggregate of 10 cfs to baseflows at all times when flows at Carsonville drop below 75 cfs.
    i. In the upper Flint, aggregate nominal storage in government reservoirs is slightly over 44,000 acre-feet (14.3 billion gallons); reference: GA EPD letter from Nolton Johnson to USACOE August 2001. The figures do not include reservoirs in Meriwether and Upson Counties, which would add to the total(s).
    ii. Total summertime, drought-conditions use (withdrawals) in the Upper Flint is (are) difficult to calculate. Our first reference should be the inputs to the model we are currently using. Other references are the 2010 Metro District report, and American Rivers' "Running Dry" report.
    iii. The above calculation needs to be compared to 2- and 3- year 'needs' for withdrawal from storage in the upper Flint, as a reality check.

iv. If 10 cfs ran for 1000 days during a horrific drought of circa 3 years (recognizing that it DOES rain during droughts, and that there are many times when flows would exceed any given/chosen threshold, that flow support would probably be somewhat less-than-elegantly managed, and that the duration would likely be much less than 1,000 days), the total supplemented volume would approximate between 6 billion and 7 billion gallons. This seems reasonable compared to the total storage in the upper Flint, even without knowing what total withdrawal needs are across a 3 year drought.
v. Other release amounts/rates, and pulsing can also be explored.

Appendix C. Blank Form

Water Management Alternative Submittal Form

Contact Information:

Contact Name:	
Which Caucus do you represent?	
What stakeholder interests does this water management alternative address?	
Telephone Number:	E-mail Address:

Alternative Description
Describe your alternative by providing information in the following four categories.

1. **Changes to Water Use:** Water use refers to water that is actually used for a specific purpose, such as for domestic use, irrigation, or industrial processing**.**

2. Changes to Water Returns: Water return refers to water released from wastewater treatment plants or water returned to the environment.

3. Changes to Storage: Storage could include additional lakes or basins for the storage, regulation, and control of water or other means, such as Aquifer Storage and Recovery.

4. Changes to Lake Operations: Describe any changes to current reservoir operations.

Key Assumptions: If known, describe any key assumptions that are needed for this alternative.

Additional Information

Measure of Success: Describe your quantitative and/or qualitative measures of success.

Legal / Public Policy Considerations: Describe legal/public policy considerations associated with the option.

Implementation Risk / Uncertainty: Describe any aspects of the option that involves risk or uncertainty related to implementing the option.

Costs: Provide cost and funding information, if available. Identify what is and is not included in the provided cost numbers and provide references used for cost justification.

Other Information: Provide other information as appropriate, including potential secondary benefits or considerations. Attach supporting documentation or references, if applicable.

Upload Relevant Files or References
May be attached or sent electronically to Black & Veatch, osbornerr@bv.com