APPENDIX D

COORDINATION DOCUMENTATION

ATLANTA REGIONAL COMMISSION

PLANNING • LEADERSHIP • RESULTS

RECEIVED 4-16-08

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April 14, 2008

DC7

Col. Byron Jorns
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile Alabama 36602-3630

Re: Modifications to the Interim Operations and Exceptional Drought Operations Plans

Dear Col. Jorns:

I am writing on behalf of the North Georgia Water Supply Providers—the Atlanta Regional Commission, the City of Atlanta, Fulton County, Cobb County-Marietta Water Authority, DeKalb County, and the City of Gainesville—to bring certain issues to the Corps' attention that should be considered in formulating any modification to the Interim Operations Plan for Jim Woodruff Dam (IOP) and Exceptional Drought Operations Plan (EDO), which collectively set forth the current operational plans for the federal reservoirs within the Apalachicola-Chattahoochee-Flint (ACF) River Basin. I hope that these comments will aid you in developing sound operational plans to guide Corps operations while the process of updating the water control manual for the ACF Basin continues.

The drought of 2007 has highlighted the need for prudent resource management. As the Corps proceeds with the process of developing and implementing new operational plans for the federal reservoirs in the ACF River Basin, several basic flaws in the IOP must be avoided. First, the IOP prevents the storage of water during wet periods by requiring that significant portions of basin inflow be released, irrespective of reservoir levels, climatic conditions, and downstream needs. Second, the IOP's "ramping rates" cause a significant loss of storage, and have the perverse effect of requiring more water than comes into the system to be released in order to artificially slow the fall of river levels. Finally, the IOP requires that the Corps expend significant quantities of storage to artificially maintain a flow of 5,000 cfs at the Chattahoochee gage, even when flows of this level far exceed the natural unimpaired flow, are unsustainable over any period of time, and place the reservoir system in jeopardy.

In short, the IOP requires the ACF reservoir system to deliver much more water to the Apalachicola River than the system can reasonably sustain. From May to November 2007, the water delivered from the federal reservoirs on the Chattahoochee River to the Apalachicola River amounted to 220% of the river's natural, "unimpaired flow"—i.e., the flow that would have been experienced if there were no reservoirs and no depletions anywhere in the ACF River Basin—during that same time period. It is not surprising, therefore, that the IOP nearly drained the system with catastrophic results.

The EDO does much to address these fundamental flaws of the IOP: it eliminates the seasonal storage limitations that prevented the reservoirs from refilling; it eliminates the ramping rates that perversely wasted water from storage when inflows increased; and it reduces the required minimum flow at the Chattahoochee gage, thereby reducing the amount of water from storage needed to maintain unnaturally high flows in the Apalachicola River. As a result of these changes in Corps operations, and because basin inflow has increased, the condition of the federal reservoirs has improved. But we are not out of the woods yet—Lake Lanier remains at record low levels and is predicted to remain well below its rule curve elevation as we enter the dry season. Thus, the situation remains critical and requires that the Corps develop and implement prudent and conservative operational plans.

From an examination of the events of 2007, several aspects of any sound management plan become readily apparent. In the short term, the Corps must maintain the EDO, or some other set of highly protective operational rules, until each of the reservoirs has fully recovered. Moreover, the expiration of these emergency operational rules should be tied, not to composite system storage, but rather to the storage in each individual reservoir. Allowing a reversion to more relaxed and less protective operational rules before each and every reservoir in the ACF River Basin has fully recovered is simply not appropriate.

In the longer term, any modification to the IOP and EDO should, at a minimum, incorporate the following three principles. First, the Corps must adopt sustainable operating rules that prudently and conservatively balance downstream flow requirements with the ability to capture and store water for use in times of drought. The Corps must avoid operational rules, such as the IOP, that either require too much water to be passed during wet periods, and thus prevent system storage from accruing, or that rely on system storage to maintain artificial and unnaturally high flows in the Apalachicola River. Such rules are unsustainable under prolonged drought conditions, and create the risk of system-wide depletion—something that would be catastrophic both for the millions of people who rely on the federal reservoirs for their water supply and for the endangered and threatened species in the Apalachicola River.

Second, any new operational plan must afford the Corps sufficient flexibility to quickly adapt to changing inflow conditions. The rigid, formulaic storage limitations and minimum flow requirements of the IOP nearly caused a catastrophic system failure before the Corps could change course and implement the EDO. Thus, management flexibility and adaptability should be guiding principles.

I. Any New Operating Plan Must Recognize Lake Lanier's Unique Character as a Large Headwaters Reservoir

Any new operational plan must recognize Lake Lanier's unique character as a large headwaters reservoir with limited capacity to refill. Despite the relatively significant available storage in the reservoir, Lake Lanier simply cannot be used to supplement flow far downstream in the Apalachicola River on a large scale for any extended period of time. Its inflow is too limited and it takes too long to recover from such overdrafting. What is more, management rules that seek to balance available storage in the various reservoirs operate to the extreme detriment of Lake Lanier and cannot be incorporated into any new management plan. Simply put, drawing down Lake Lanier by 50% is not the same as drawing down Walter F. George by an equivalent amount. Walter F. George will recover from such a draw-down in a matter of weeks, while Lake Lanier could take years to recover. Thus, any new operational plan must account for the unique characteristics of each reservoir in the system, and must utilize each in a manner that accounts for the widely disparate storage to inflow ratios, allows for each to refill on an annual basis, and is sustainable through an extended drought period.

A. The capacity of Lake Lanier to refill is extremely limited

Lake Lanier's location in the headwaters of the ACF Basin substantially limits its capacity to refill once depleted. The conservation pool at Lake Lanier is by far the largest in the ACF Basin, with 1,087,600 af of storage. This accounts for 62.5% of the total conservation storage in the ACF River Basin. Lake Lanier's drainage area, however, is extremely small—just 1,040 square miles or 6% of the total drainage area of the basin. As a result of this ratio between reservoir storage and drainage area, once Lake Lanier is depleted, it may take years to recover.

In contrast, West Point Lake has 306,131 af of storage in its conservation pool, while its drainage area is approximately 3,440 square miles. Thus, the storage capacity of West Point Lake is just one-third of that of Lake Lanier, while its drainage area is more than three times as large. For West Point Lake, the ratio of storage capacity to drainage area is 11.8 times greater than for Lake Lanier. The difference at Walter F. George is even more pronounced. It has just 244,400 af of storage in its conservation pool, while its drainage area is approximately 7,460 square miles, or more than 7 times larger than that of Lake Lanier. Walter F. George's storage capacity to drainage area ratio is 31.9 times greater than Lake Lanier's. See Table 1.

Table 1. Comparison of storage capacity to drainage area ratios for the federal storage reservoirs in the ACF River Basin.

Project	Storage Capacity (af)	Drainage Area (sq. mi)	Ratio (drainage/storage)	Ratio Compared to Lake Lanier
Lake Lanier	1,087,600	1,040	0.00096	1
West Point	306,131	3,440	0.01124	11.8
Walter F. George	244,400	7,460	0.03052	31.9

The differences in the various reservoirs' storage to drainage area ratios, and thus their refill capacities, are apparent from their divergent responses to the EDO. During the drought of 2007, the IOP resulted in total depletion of all storage in both West Point and Walter F. George. During the winter and spring of 2008, drought conditions have, at least temporarily, moderated in portions of the ACF Basin and inflows have increased. The EDO has allowed the Corps to capture much of this inflow and, as a result, West Point and Walter F. George rose meteorically and are currently above their rule curve and at or near their summer rule curve elevations. See Figure 1 and Figure 2.

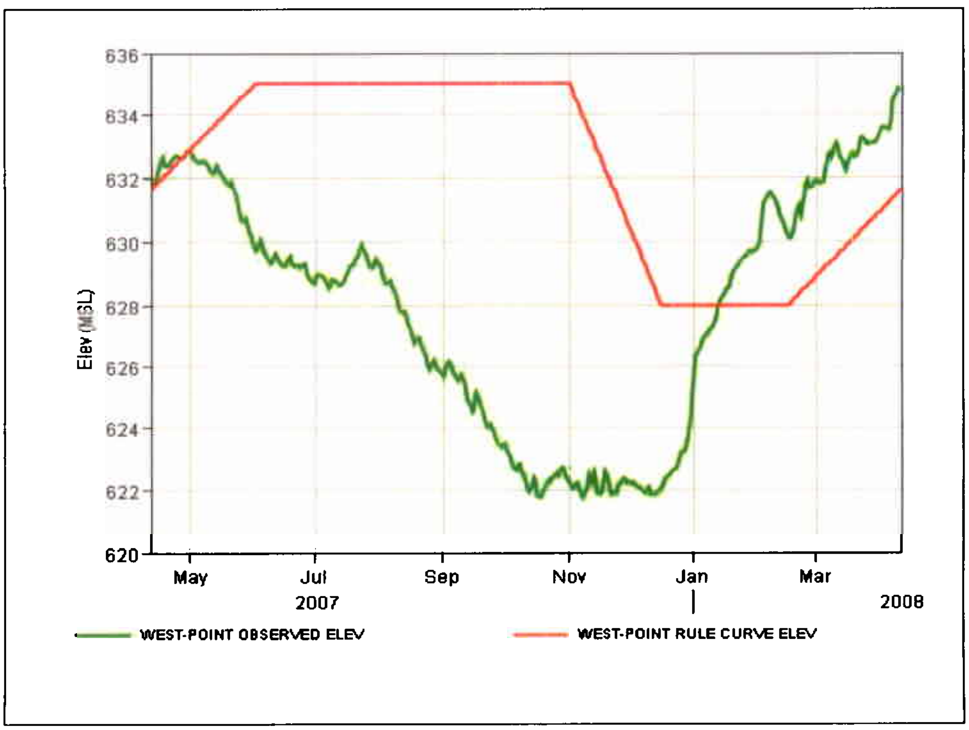


Figure 1. Corps of Engineers plot showing elevation of West Point Lake on April 10, 2008 in comparison to its rule curve elevation.

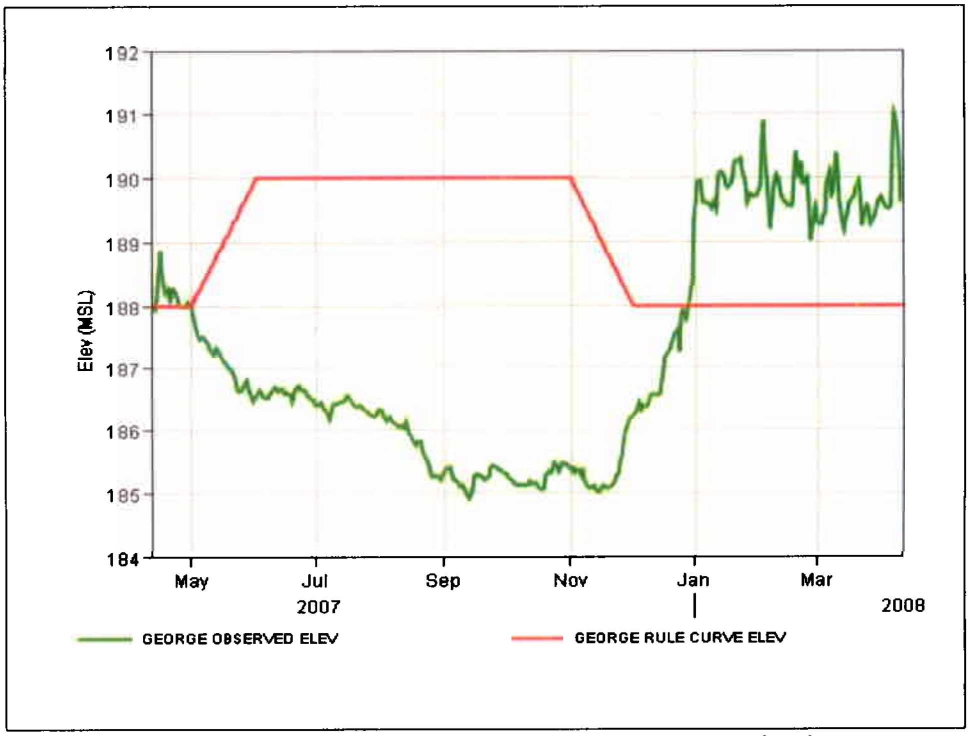


Figure 2. Corps of Engineers plot showing elevation of Lake Walter F. George on April 10, 2008 in comparison to its rule curve elevation.

Lake Lanier, however, presents a far different and more dire picture. As of April 10, 2008, Lake Lanier remains approximately 5 feet below its record low elevation for this time of year, and 13 feet below its rule curve. Even under the EDO's extremely protective operating rules, its condition is not expected to improve significantly in the near term. See Figure 3 and Figure 4. Thus, in the absence of dramatic improvement in inflow conditions above Lake Lanier, which is not currently predicted, there is a high probability that Lake Lanier will enter the dry summer and fall seasons far below its rule curve elevation.

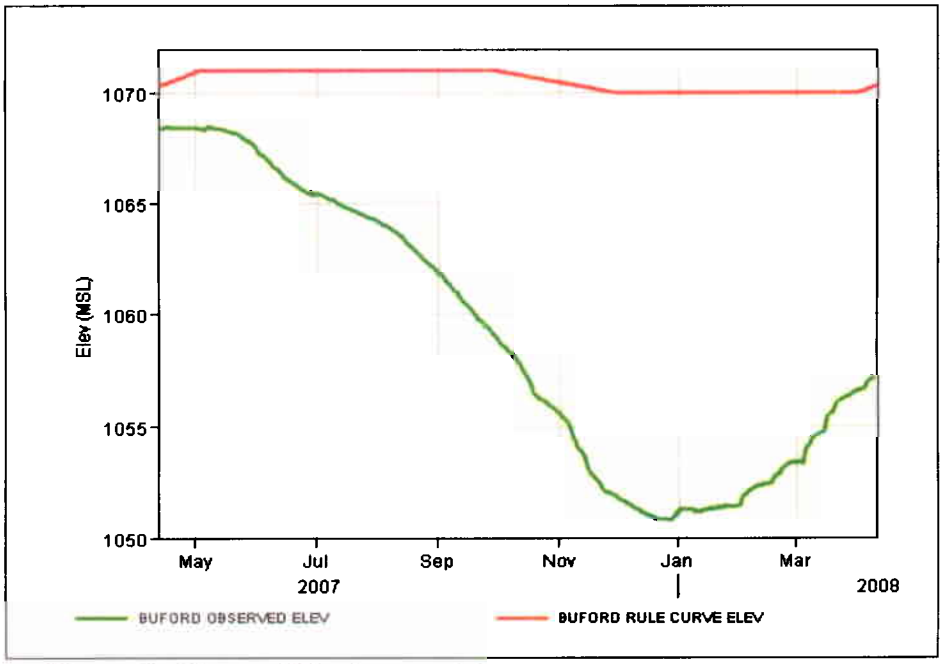


Figure 3. Corps of Engineers plot showing elevation of Lake Lanier as of April 10, 2008.

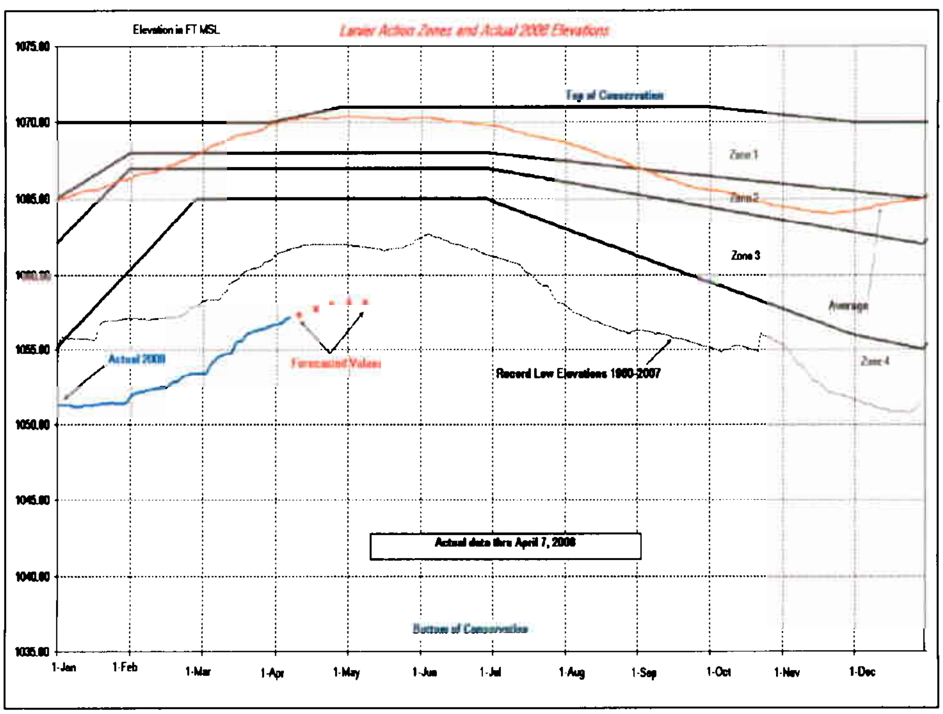


Figure 4. Corps of Engineers plot showing current, historic low, and projected elevations for Lake Lanier as of April 7, 2008.

Any new operating plan the Corps develops must recognize this inherent physical difference between Lake Lanier and the other reservoirs in the ACF River Basin. It cannot simply treat them similarly, because they are not similar. Rather, it must appropriately scale releases and operational demands to reflect the physical differences in the reservoirs.

B. Extreme drought conditions persist in the Upper ACF River Basin

Not only are the reservoirs physically and geographically different, but the meteorological conditions in their respective drainage basins vary as well. Any new operational plan must account for meteorological differences within the basin, and allow the Corps to adjust release patterns and other operational parameters accordingly.

Although, as discussed above, drought conditions in the lower ACF Basin have moderated recently, extreme drought conditions persist in the northern portion of the basin. See Figure 5. This has resulted in continued low inflows into Lake Lanier, which according to the Corps' statistics, are in the 10th percentile.

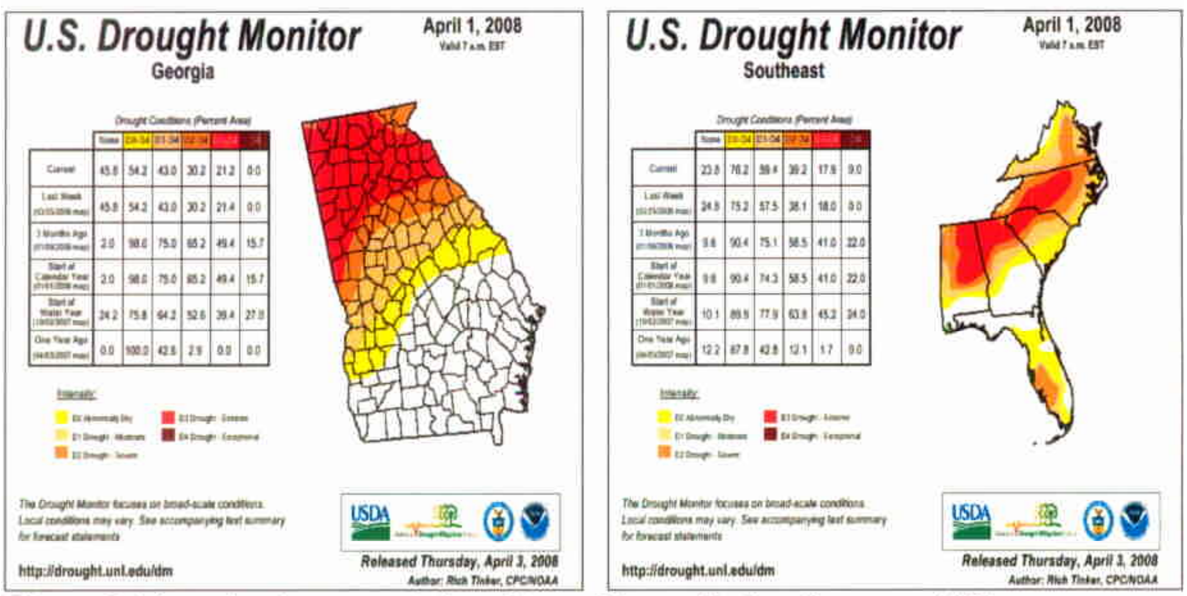


Figure 5. Maps showing current drought conditions affecting the upper ACF Basin.

Any new operational plan must afford the Corps sufficient flexibility to manage the federal reservoirs in the ACF River Basin in a manner that accounts for the wide divergence in current and predicted inflow conditions.

C. Any new operational plan must be sufficiently protective and conservative to allow Lake Lanier to fully recover

Any modifications to the IOP/EDO must allow the Corps sufficient flexibility in setting releases to take account of Lake Lanier's character as a large headwaters reservoir with limited refill capacity as well as the persistent drought conditions in the northern half of the ACF Basin. Moreover, such a plan must maximize the probability that Lake Lanier refills. If this is to be accomplished, the Corps must maximize the capacity to store inflows into Lake Lanier. Mandatory, uniform flow requirements and limitations on storage that fail to address the physical and meteorological differences between the reservoirs within the ACF River Basin, as well Lake Lanier's current deficit, are not appropriate.

What is more, given the current drought conditions affecting Lake Lanier, the new operational plan, at least with respect to Lake Lanier, must be extremely conservative and closely follow the EDO. Thus, the new operational plan must continue to allow the Corps to minimize releases from Lake Lanier and prevent its use for any downstream flow supplementation, over and above flow targets at Peachtree Creek until Lake Lanier fully recovers. Indeed, if drought conditions persist, Lake Lanier's elevation would dramatically decline, even under the current EDO. See Figure 6. If the Corps were to reinstitute the IOP, conservation storage would be exhausted. Similarly, if the drought conditions experienced in 2007 were to worsen by just 15%, conservation storage would be exhausted even under the EDO. See Figure 7. Thus, whatever operational plan the Corps develops, it is clear that it must maximize the ability to store inflows into Lake Lanier to aid in the reservoir's recovery.

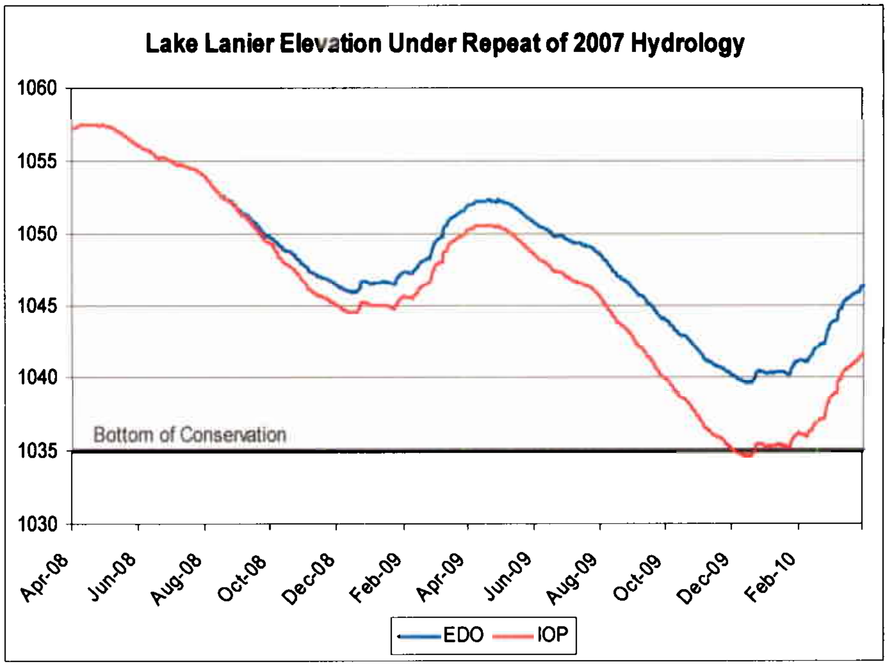


Figure 6. Elevation of Lake Lanier under continued drought conditions.

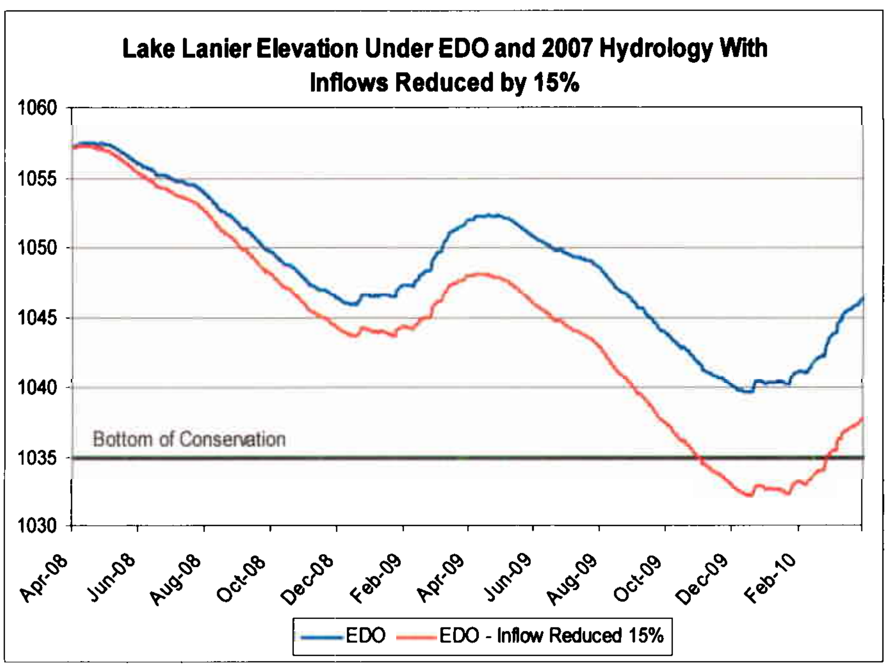


Figure 7. Elevation of Lake Lanier under EDO and reduced inflow conditions.

D. The Corps must not rely upon Lake Lanier's inactive storage pool to meet demands within the ACF Basin

During the fall of 2007, the IOP, in conjunction with record drought conditions across the ACF Basin, caused the federal reservoirs within the basin to reach dramatically lows levels. At the same time, the elevation of Lake Lanier was falling at an alarming rate. This caused many to question whether, under the IOP, there would be sufficient water in Lake Lanier to meet the water supply needs of metropolitan Atlanta. In response to these questions and concerns, and faced with record low reservoir levels, the Corps stated that it could utilize water stored in the "inactive" or "dead" storage pool for water metropolitan Atlanta's supply needs in the event that conditions did not improve.

The North Georgia Water Supply Providers recognize and appreciate the Corps' willingness to consider any and all alternatives to avoid a catastrophic inability to meet the water supply needs of a major metropolitan area. Although the Corps has correctly never indicated that it would or could operate Lake Lanier at elevations below elevation 1035 on a consistent basis, others have suggested that such operations would be appropriate. Therefore, to be clear, future operational plans must not rely on inactive storage to meet downstream demands. As the Corps formulates its proposed modification to the IOP/EDO, it is imperative that it not be modeled and evaluated using the assumption that inactive storage is available to meet requirements.

The Corps has not provided specific plans detailing how Buford Dam will be operated in the event that the conservation pool at Lake Lanier is exhausted. Nor has the Corps provided any technical assessment, design memorandum, or other engineering data that would support the proposition that Lake Lanier and Buford dam can be safely operated at elevations between 1035 and 919, levels not seen since Lake Lanier's initial filling. Similarly, the Corps has not established that it can sufficiently control releases through the sluice gates to meet downstream needs if Lake Lanier's elevation were to fall below 1020, the level of the small "house unit." In the absence of such clear operational plans and technical analyses, it would be arbitrary and capricious to formulate operational rules that rely upon water in the inactive storage pool to meet downstream needs.

Moreover, even assuming that Buford Dam could be safely and effectively operated at such unprecedented low elevations, operational plans predicated upon the use of water in the inactive storage pool would be imprudent and ignore Lake Lanier's limited capacity to refill. As explained above, the extraordinary storage to drainage area ratio means that once Lake Lanier is depleted, it may take years to refill. Moreover, such extreme draw-downs pose substantial risks to the water supply of metropolitan Atlanta, and all other downstream interests, because the Corps would have no storage from which to draw in the event of a prolonged, multi-year drought. Future operational rules developed must recognize this limitation, which is unique among the federal reservoirs in the ACF Basin, by allowing the Corps sufficient flexibility to tailor releases to conserve storage in Lake Lanier.

The events of 2007 clearly demonstrate the need for conservative management and operational flexibility. The Corps' adherence to the rigid release requirements mandated by the IOP in the face of extraordinary drought conditions caused Lake Lanier, along with the other federal reservoirs, to be drawn down to record low levels. The Corps, recognizing that the releases and storage limitations under the IOP were unsustainable and placed the system in jeopardy, instituted the EDO, which all parties would agree is an extremely conservative response to emergency conditions. But, even the EDO has not succeeded in refilling Lake Lanier, which remains at a record low elevation for this time of year. In short, there is little else that the Corps can do to remedy the effects of the IOP. Given this history, any operational plan that would draw Lake Lanier down to such record low levels in drought periods would be irresponsible and place the entire system at risk.

II. New Water Control Plans Based on Facts and Sound Science Must Be Adopted by the Corps for the ACF Reservoirs.

In the longer term, we need a comprehensive new water control plan based on facts and sound science. The North Georgia Water Supply Providers strongly support the Corps' current initiative to update water control plans for the ACF Basin because we know that ACF basin has sufficient water to meet the reasonable demands of all users—including towns and cities, power generation, farmers and fishermen and endangered species—if the reservoirs are managed properly.

We know this can be done because we have already found a way to do it. On January 10, 2007, the Water Supply Providers submitted a proposal to the Corps which we call the "Maximum Sustainable Release Rule." Although many parties have expressed an interest in this plan, the Corps has yet to give it any serious consideration. We urge you to study this and other alternatives as you develop new water control plans for the ACF Reservoirs.

III. Conclusion

In conclusion, I hope that you will consider these points as you proceed with the process of developing and implementing a new, interim operating plan for the federal reservoirs in the ACF River Basin. We look forward to working with you and the other stakeholders as this process proceeds.

Sincerely,

Charles Krautler

Charles Krautler,
Director

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

REPLY TO
ATTENTION OF

April 15, 2008

Inland Environment Team
Planning and Environmental Division

Ms. Gail Carmody
Field Supervisor
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, Florida 32405-3721

Dear Ms. Carmody:

This letter is to request the initiation of formal consultation pursuant to Section 7 of the Endangered Species Act of 1973 (ESA), on the U.S. Army Corps of Engineers (Corps), Mobile District's proposed modifications to the current Interim Operations Plan (IOP) at Jim Woodruff Dam in support of federally-listed species and critical habitat on the Apalachicola River. Mobile District completed Section 7 consultation with the U.S. Fish and Wildlife Service (USFWS) on September 5, 2006 for the IOP.

The September 5, 2006 Biological Opinion (BO) issued on the IOP included a Reasonable and Prudent Measure Number 3 (RPM3) requiring the development of modifications to the IOP that would provide for higher desired minimum flows when hydrological and climatic conditions allowed and identification of a trigger that would determine when it would be reasonable and prudent to revert to the 5,000 cubic feet per second (cfs) minimum flow (as required in the current Apalachicola-Chattahoochee-Flint [ACF] water control plan). These higher minimum flow provisions were submitted by the Corps on February 16, 2007, and the modified IOP (current IOP) was approved by the USFWS on February 28, 2007. The prolonged exceptional drought conditions experienced in the ACF basin throughout the spring and summer of 2007 resulted in impacts to the basin and composite storage within the basin that were unanticipated by the previous IOP analyses. Therefore, in accordance with the adaptive management provisions of RPM1 of the BO, in November 2007, the Corps requested initiation of formal consultation for a temporary drought contingency modification to the IOP, termed the Exceptional Drought Operations (EDO). The EDO represented a temporary modification of the currently approved IOP intended to minimize adverse impacts to federally listed species in the Apalachicola River while providing continued support to other critical basin water uses during an exceptional basin-wide, multi-year drought. The EDO included incremental reductions in the minimum flow requirement at Jim Woodruff Dam based on composite storage and basin inflow triggers. On November 15, 2007, the USFWS approved the EDO by amending the September

2006 BO. The Incidental Take Statement (ITS) for the EDO expires on June 1, 2008, subject to further consultation.

The proposed action was developed based upon review of the current species information, basin stakeholder input, lessons learned from 2006-07, and continuing discussions between our staffs. The proposed modifications to the current IOP are intended to support listed species and their critical habitat in the Apalachicola River and avoid or minimize potential adverse impacts associated with discretionary operations at Jim Woodruff Dam. Throughout our previous consultations on the IOP and its implementation, we learned that two issues needed further consideration 1) incorporation of some form of drought plan, and 2) additional need for storage conservation when system storage is low. In fact, the RPM3 modifications incorporated into the current IOP were based, in part, on addressing these concerns. The proposed action further addresses these needs by 1) incorporating a drought contingency plan that allows for additional storage conservation and system recovery during periods of extreme drought, and 2) providing additional opportunities to conserve storage as we enter and exit drought conditions while still providing support for listed species and their critical habitat in the Apalachicola River. A detailed description of the proposed action is enclosed. Shortly, we will be providing the USFWS electronic versions of the modeling results for the period of record (1939-2007) and forecast analyses (12 month projection); preliminary effects analyses consistent with those used for the previous IOP consultations; and other supplemental information. As with the past consultations, we will continue our close coordination with your office to assist in concluding this consultation process and reaching consensus on any reasonable or prudent measures that may be appropriate.

We have determined, based on review of the modeling data and informal consultation with your office, that the proposed modifications of the current IOP are likely to adversely affect the threatened Gulf sturgeon (*Acipenser oxyrinchus desotoi*), endangered fat threeridge mussel (*Amblema neislerii*), threatened purple bankclimber mussel (*Elliptoideus sloatianus*) and threatened Chipola slabshell (*Eliptio chipolaensis*) and designated critical habitat for these listed species. It is understood that our consultation discussions over the coming weeks could identify additional modifications to the current IOP that could provide for additional minimization of harm to the species.

We request your review of the proposed action with respect to ESA compliance and that you provide a biological opinion. Operations under the proposed action will be implemented and continued until such time as additional formal consultation may again be initiated and completed, either in association with the update and revision of water control plans for the ACF system, or sooner if conditions change or additional information is developed to justify a possible revision to operations. It is anticipated that the proposed modifications will accommodate continuing and future drought conditions within the basin based on the modeling that we will provide to you soon. However, should severe drought conditions persist for additional years or more severe droughts than modeled occur, additional modifications or temporary drought contingencies may need to be developed and consulted with your staff. Should you have any questions, comments, or recommendations, please contact Mr. Brian Zettle, (251) 690-2115, Email: brian.a.zettle@sam.usace.army.mil

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosure

April 2008

Description of Proposed Action
Modification to the Interim Operations Plan at Jim Woodruff Dam

The proposed action does not represent a new water control plan for Jim Woodruff Dam. The proposed action is a modification of the current Interim Operations Plan (IOP), which is a definition of temporary discretionary operations within the limits and rule curves established by the existing water control plan (1989). The drought plan incorporated into the proposed action would require a temporary waiver from the existing water control plan to provide for minimum releases less than 5,000 cubic feet per second (cfs) from Jim Woodruff Dam when the appropriate triggers are met and would also include provisions to allow temporary storage above the winter pool rule curve at the Walter F. George and West Point projects if the opportunity presents itself and/or begin spring refill operations at an earlier date in order to provide additional conservation storage for future needs. Operations under the proposed action will be implemented and continued until such time as additional formal consultation may again be initiated and completed, either in association with the proposed update and revision of water control plans for the Apalachicola-Chattahoochee-Flint (ACF) system, or sooner if conditions change or additional information is developed to justify a possible revision to operations.

The U.S. Army Corps of Engineers, Mobile District (Corps) operates five Federal reservoirs on the ACF as a system, and releases made from Jim Woodruff Dam under the proposed action reflect the downstream end-result for system-wide operations measured by daily releases from Jim Woodruff Dam into the Apalachicola River. The proposed action does not address operational specifics at the four federal reservoirs upstream of Jim Woodruff Dam or other operational parameters at these reservoirs unless the drought contingency operations have been triggered. At that time, temporary changes to the amount and timing of storage at the Walter F. George and West Point projects would be triggered. During normal operations, the proposed action does not include specific operational requirements at the upstream reservoirs other than the use of the composite reservoir storage of the system and releases from the upstream reservoirs as necessary to assure releases from Jim Woodruff Dam support and minimize adverse impacts to endangered or threatened species or critical habitat. Because the listed species and critical habitat areas of concern are predominately located only on the Apalachicola River downstream of Jim Woodruff Dam, the primary operational consideration for the IOP and the proposed modifications are the timing and quantity of flows released from the dam.

Like the current IOP, the proposed action specifies two parameters applicable to the daily releases from Jim Woodruff Dam: a minimum discharge and a maximum fall rate. Also like the current IOP, the proposed action places limitations on refill, but does not require a net drawdown of composite storage unless basin inflow is less than 5,000 cfs. However, the proposed action modifies how the minimum discharge is determined and identifies conditions under which maintenance of the maximum fall rate schedule is suspended and more conservative drought contingency operations begin. The proposed action does not change the current IOP basin inflow calculation (7-day moving average daily basin inflow), use of Chattahoochee gage to measure releases/river flow, use of volumetric balancing as described in the May 16, 2007 letter to the U.S. Fish and Wildlife Service (USFWS), nor the limited hydropower peaking operations at Jim Woodruff Dam. A detailed description of the proposed action and how it modifies the current IOP is provided below.

Minimum Discharge: Like the current IOP, the proposed action varies minimum discharges from Jim Woodruff Dam by basin inflow and by month and the releases are measured as a daily average flow in cfs at the Chattahoochee gage. Table 1 shows minimum releases from Jim Woodruff Dam prescribed by the proposed action and shows when and how much basin inflow is available for increasing reservoir storage. Except when basin inflow is less than 5,000 cfs, the minimum releases are not required to exceed basin inflow. The current IOP defines three basin inflow threshold levels that vary by two seasons (spawning and non-spawning season). The proposed action defines additional basin inflow threshold levels that vary by three seasons: spawning season (March-May); non-spawning season (June-November); and winter (December-February). The proposed action further modifies the current IOP by also incorporating composite storage thresholds that factor into minimum release decisions. Composite storage is calculated by combining the storage of Lake Sidney Lanier, West Point Lake, and Walter F. George Lake. Each of the individual storage reservoirs consists of four Zones. These Zones are determined by the operational guide curve for each project. The composite storage utilizes the four Zone concepts as well; i.e., Zone 1 of the composite storage represents the combined storage available in Zone 1 for each of the three storage reservoirs.

During the spawning season, two sets of four basin inflow thresholds and corresponding releases exist based on composite storage. When composite storage is in Zones 1 and 2, a less conservative operation is in place. When composite storage is in Zone 3, a more conservative operation is in place while still avoiding or minimizing impacts to listed species and critical habitat in the river. When composite storage falls below the bottom of Zone 3 into Zone 4 the drought contingency operations are “triggered” representing the most conservative operational plan. A detailed description of the drought contingency operations is provided below. During the spawning season, a daily monitoring plan that tracks composite storage will be implemented in order to determine water management operations. Recent climatic and hydrological conditions experienced and meteorological forecasts will be used in addition to the composite storage values when determining the appropriate basin inflow thresholds to utilize in the upcoming days.

During the non-spawning season, one set of four basin inflow thresholds and corresponding releases exists based on composite storage in Zones 1-3. When composite storage falls below the bottom of Zone 3 into Zone 4 the drought contingency operations are “triggered”.

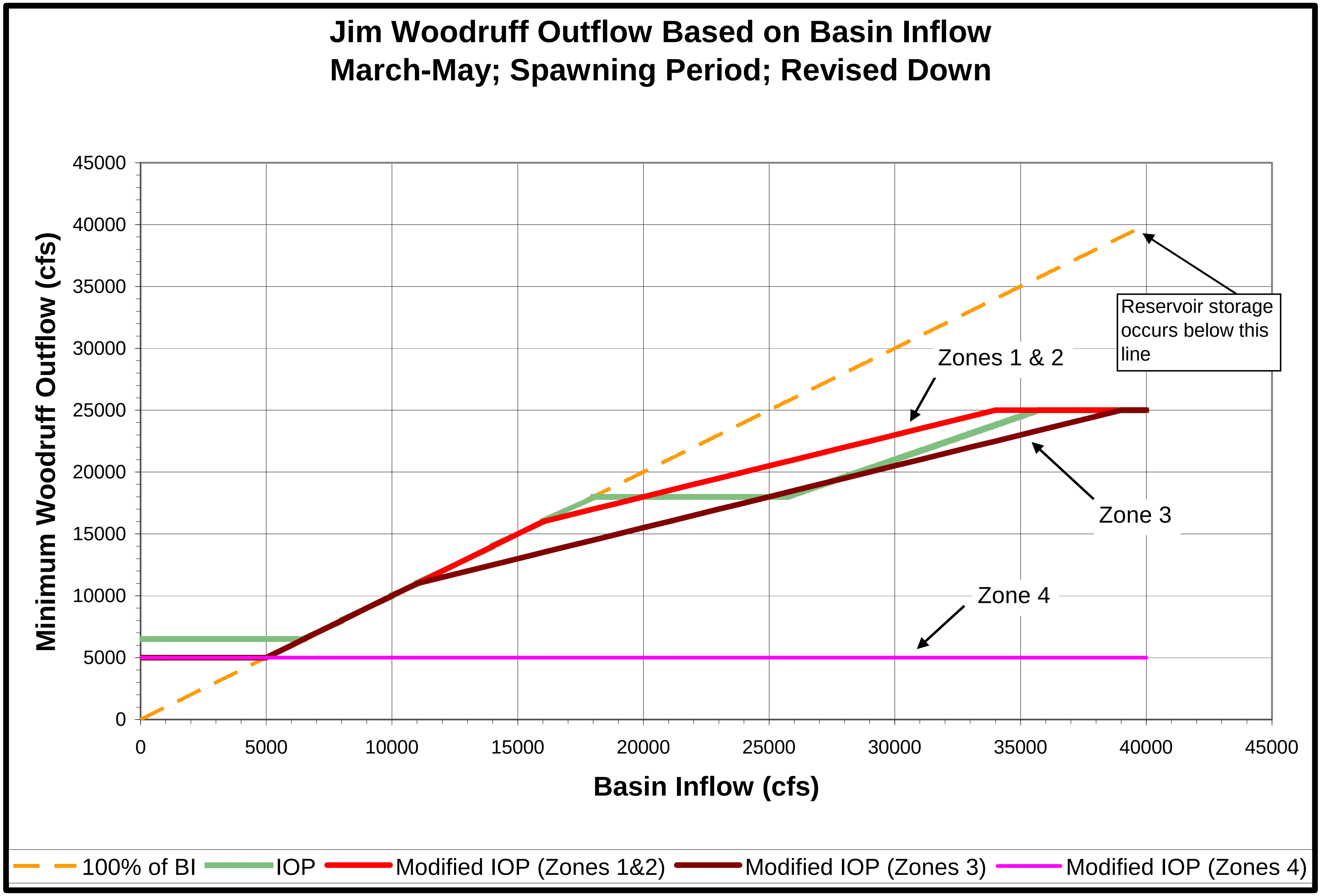
During the winter season, there is only one basin inflow threshold and corresponding minimum release (5,000 cfs) while in composite storage Zones 1-3. There are no basin inflow storage restrictions as long as this minimum flow is met under these conditions. When composite storage falls below the bottom of Zone 3 into Zone 4 the drought contingency operations are “triggered”.

The figures below provide a graphical comparison of the operational provisions of the current IOP and the proposed action.

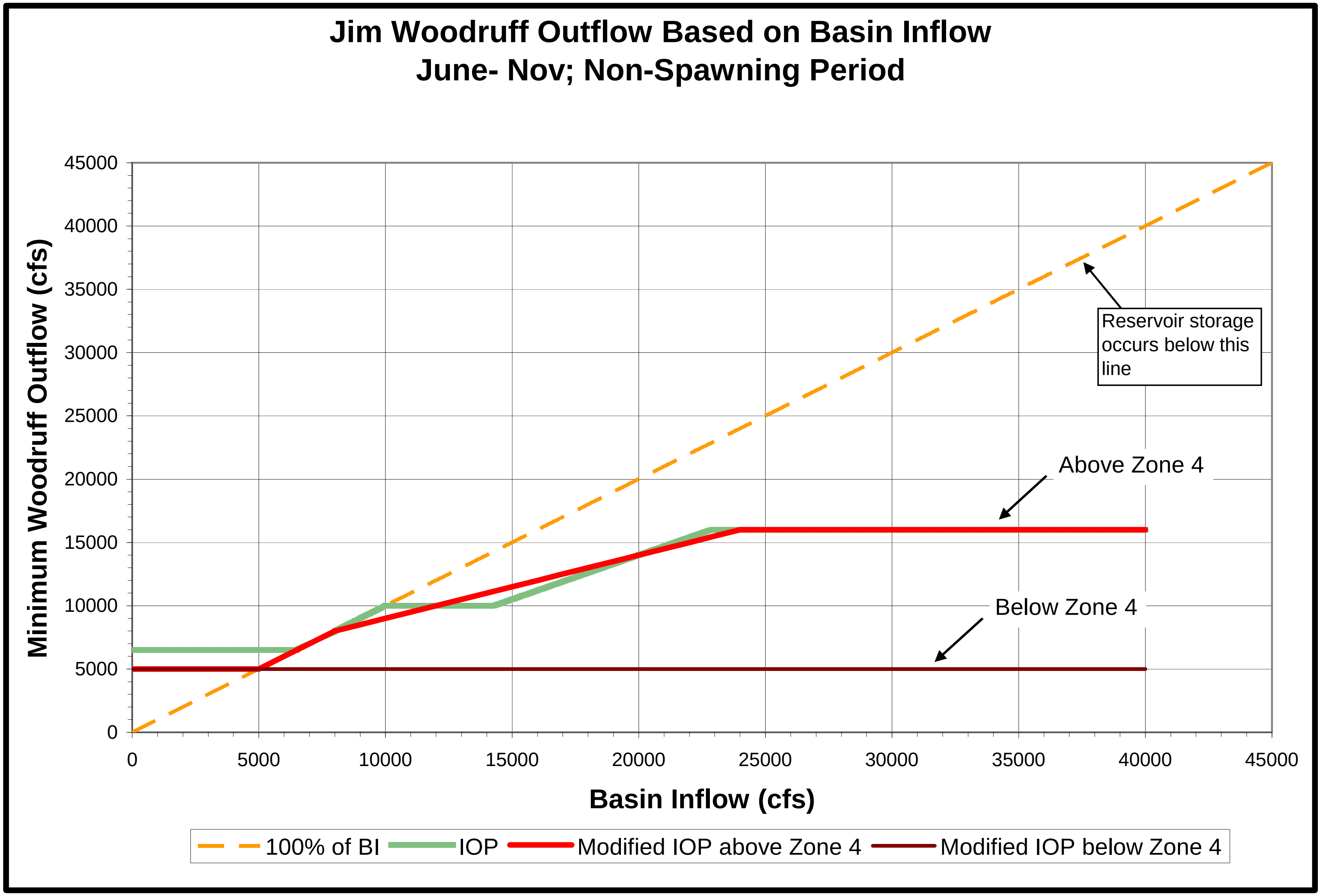
Table 1. Proposed Action Modified IOP Releases From Jim Woodruff Dam

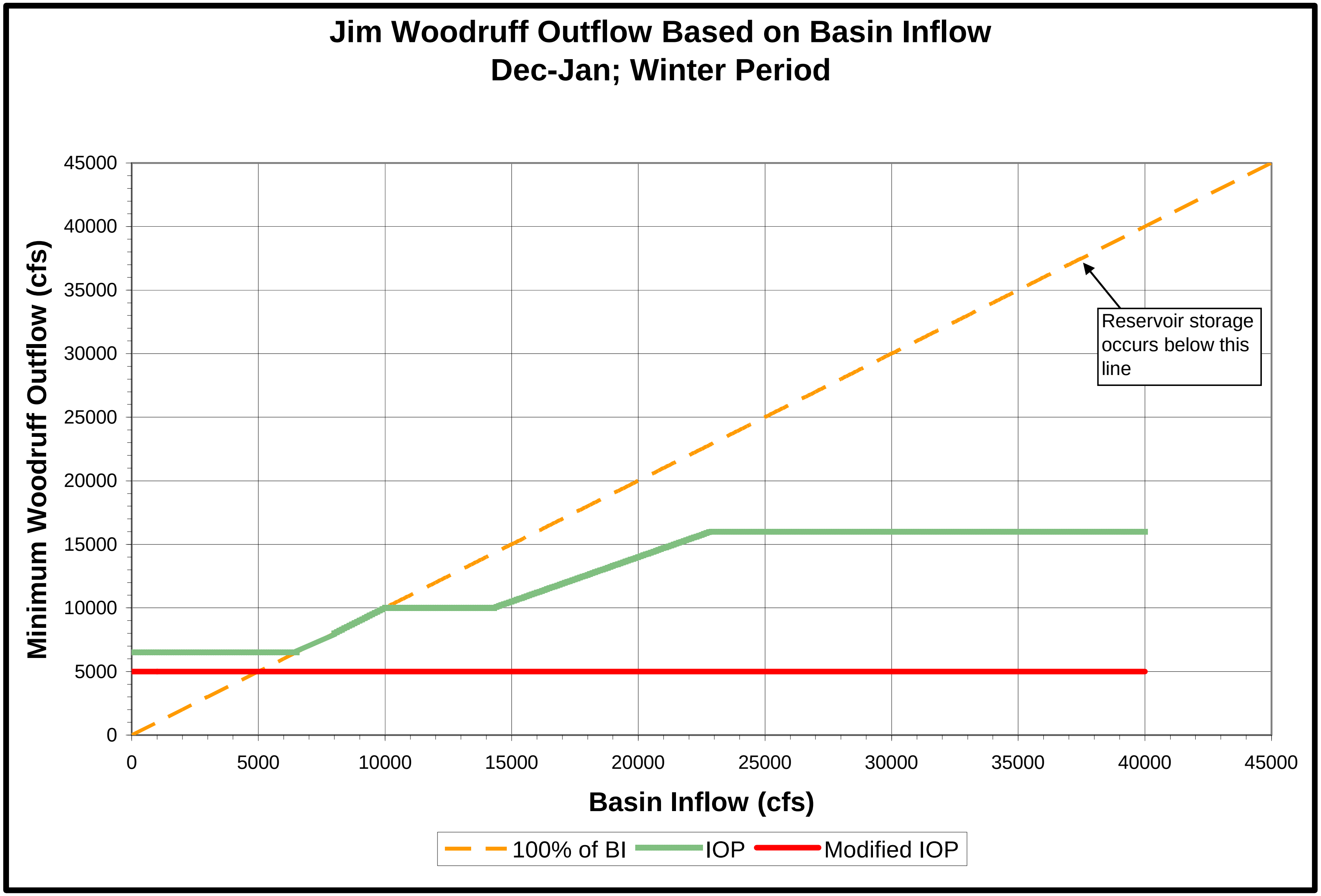
Months	**Composite Storage Zone**	**Basin Inflow (BI) (cfs)**	**Releases from JWLD (cfs)**	**Basin Inflow Available for Storage**[1]
March - May	Zones 1 and 2	>= 34,000	>= 25,000	Up to 100% BI > 25,000
		>= 16,000 and < 34,000	>= 16,000 + 50% BI > 16,000	Up to 50% BI > 16,000
		>= 5,000 and < 16,000	>= BI	
		< 5,000	>= 5,000	
	Zone 3	>= 39,000	>= 25,000	Up to 100% BI > 25,000
		>= 11,000 and < 39,000	>= 11,000 + 50% BI > 11,000	Up to 50% BI > 11,000
		>= 5,000 and < 11,000	>= BI	
		< 5,000	>= 5,000	
June - November	Zones 1,2, and 3	>= 24,000	>= 16,000	Up to 100% BI > 16,000
		>= 8,000 and < 24,000	>= 8,000 + 50% BI > 8,000	Up to 50% BI > 8,000
		>= 5,000 and < 8,000	>= BI	
		< 5,000	>= 5,000	
December - February	Zones 1,2, and 3	>= 5,000	>= 5,000 (Store all BI > 5,000)	Up to 100% BI > 5,000
		< 5,000	>= 5,000	
At all times	Zone 4	NA	>= 5,000	Up to 100% BI > 5,000
At all times	Drought Zone	NA	>= 4,500[2]	Up to 100% BI > 4,500

[1] Consistent with safety requirements, flood control purposes, and equipment capabilities.
[2] Once composite storage falls below the top of the Drought Zone ramp down to 4,500 cfs will occur at a rate of 0.25 ft/day drop.



Jim Woodruff Outflow Based on Basin Inflow
March-May; Spawning Period; Revised Down
Minimum Woodruff Outflow (cfs)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Basin Inflow (cfs)
Reservoir storage occurs below this line
Zones 1 & 2
Zone 3
Zone 4
100% of BI
IOP
Modified IOP (Zones 1&2)
Modified IOP (Zones 3)
Modified IOP (Zones 4)


Jim Woodruff Outflow Based on Basin Inflow
June- Nov; Non-Spawning Period
Minimum Woodruff Outflow (cfs)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Basin Inflow (cfs)
Reservoir storage occurs below this line
Above Zone 4
Below Zone 4
100% of BI
IOP
Modified IOP above Zone 4
Modified IOP below Zone 4



Jim Woodruff Outflow Based on Basin Inflow
Dec-Jan; Winter Period
Minimum Woodruff Outflow (cfs)
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Basin Inflow (cfs)
Reservoir storage occurs below this line
100% of BI
IOP
Modified IOP

According to Reasonable and Prudent Measure (RPM) 3 of the Biological Opinion (BO), the current IOP includes a higher minimum flow provision that identified conditions where a desired minimum flow (6,500cfs) would be maintained and a "trigger" to determine those conditions when the required minimum flow (5,000 cfs) would be more prudent than the desired minimum flow. The proposed action does not include this higher minimum flow provision. We believe incorporation of additional basin inflow thresholds for the spawning and non-spawning seasons as well as composite storage thresholds meets the intent of the higher flow provision.

Like the current IOP, the flow rates included in Table 1 prescribe minimum, and not target, releases for Jim Woodruff Dam. During a given month and basin inflow rate, releases greater than the Table 1 minimum releases may occur consistent with the maximum fall rate schedule, described below, or as needed to achieve other project purposes, such as hydropower or flood control.

Maximum Fall Rate: Fall rate, also called down-ramping rate, is the vertical drop in river stage (water surface elevation) that occurs over a given period. The fall rates are expressed in units of feet per day (ft/day), and are measured at the Chattahoochee gage as the difference between the daily average river stage of consecutive calendar days. Rise rates (*e.g.*, today's average river stage is higher than yesterday's) are not addressed. The proposed action does not change the maximum fall rate schedule (Table 2) prescribed by the current IOP other than to suspend it when composite storage is in Zone 4 and the drought contingency operation described below is implemented. Unless otherwise noted, fall rates under the drought contingency operation would be managed to match the fall rate of the basin inflow. Also, the proposed action does not change the use of volumetric balancing as described in the May 16, 2007, letter to the USFWS, which is intended to prevent a substantial drawdown of storage due to gradual down ramping while following declining basin inflow.

Drought Contingency Operations: The proposed action incorporates a drought contingency operation (referred to as drought plan) that does not exist in the current IOP. The drought plan is similar to the current Exceptional Drought Operations (EDO) in that it specifies a minimum release from Jim Woodruff Dam and temporarily suspends the other minimum release and maximum fall rate provisions until composite storage within the basin is replenished to a level that can support them. The minimum discharge is determined in relation to composite storage and not average basin inflow under the drought plan. The drought plan is "triggered" when composite storage falls below the bottom of Zone 3 into Zone 4. At that time all the composite storage Zone 1-3 provisions (seasonal storage limitations, maximum fall rate schedule, minimum flow thresholds, and volumetric balancing accounting) are suspended and management decisions are based on the provisions of the drought plan. The drought plan includes a temporary waiver from the existing water control plan to allow temporary storage above the winter pool rule curve at the Walter F. George and West Point projects if the opportunity presents itself and/or begin spring refill operations at an earlier date in order to provide additional conservation storage for future needs as well as provide for a minimum releases less than 5,000 cfs from Jim Woodruff Dam.

Table 2. Proposed Action Modified IOP Maximum Fall Rate Schedule Composite Storage Zones 1,2, and 3*

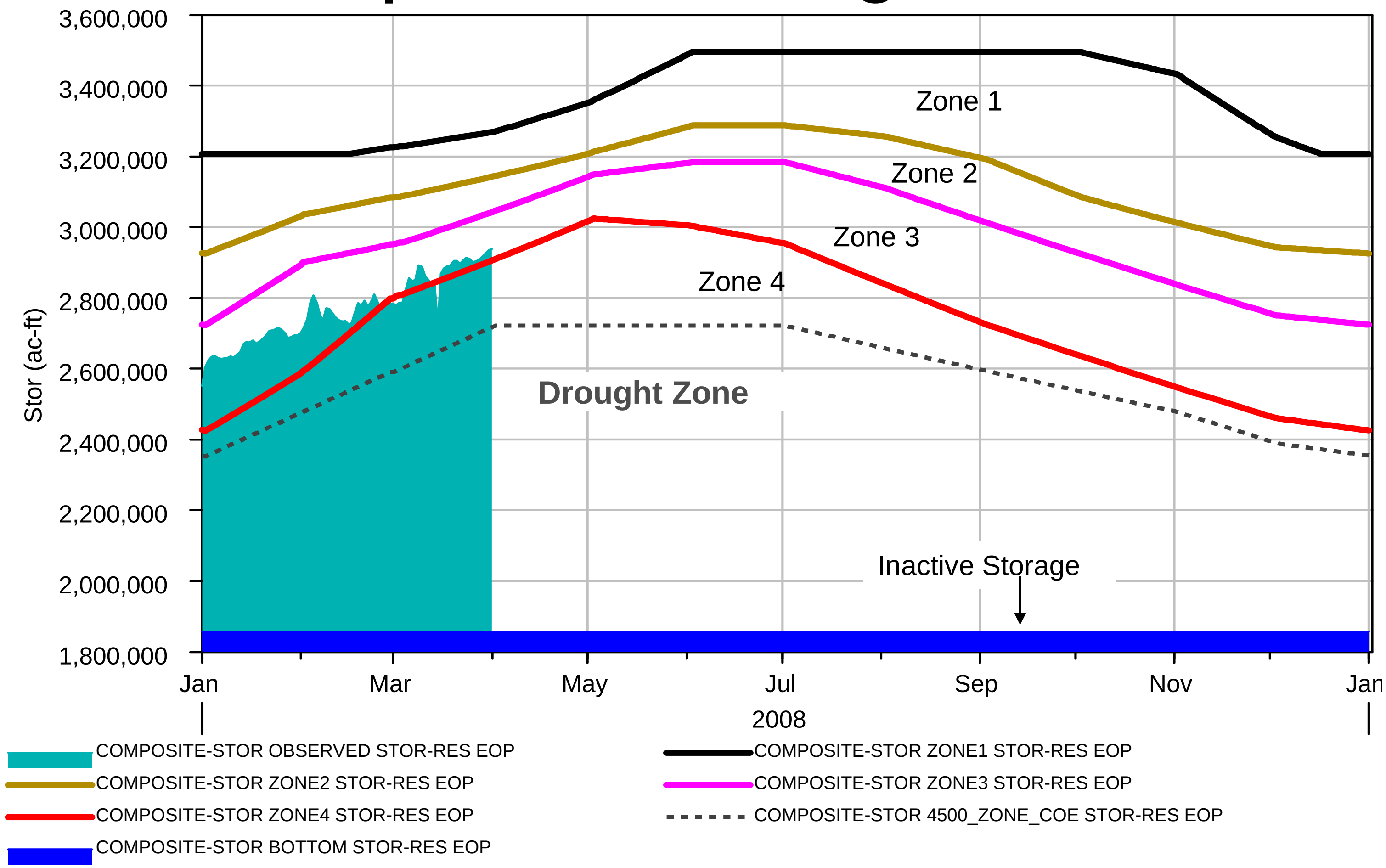
Release Range (cfs)	Maximum Fall Rate (ft/day), measured at Chattahoochee gage
> 30,000**	No ramping restriction***
> 20,000 and <= 30,000*	1.0 to 2.0
Exceeds Powerhouse Capacity (~ 16,000) and <= 20,000*	0.5 to 1.0
Within Powerhouse Capacity and > 8,000*	0.25 to 0.5
Within Powerhouse Capacity and <= 8,000*	0.25 or less

*Maximum fall rate schedule is suspended in Composite Zone 4
**Consistent with safety requirements, flood control purposes, and equipment capabilities.
***For flows greater than 30,000 cfs, it is not reasonable and prudent to attempt to control down ramping rate, and no ramping rate is required.

The drought plan prescribes two minimum releases based on composite storage in Zone 4 and an additional zone referred to as the Drought Zone (see Composite Storage Zones figure on the following page). The Drought Zone delineates a volume of water roughly equivalent to the inactive storage in lakes Lanier, West Point and Walter F. George plus Zone 4 storage in Lake Lanier. The Drought Zone line has been adjusted to include a smaller volume of water at the beginning and end of the calendar year. When the composite storage is within Zone 4 and above the Drought Zone, the minimum release from Jim Woodruff Dam is 5,000 cfs and all basin inflow above 5,000 cfs that is capable of being stored may be stored. Once the composite storage falls below the Drought Zone, the minimum release from Jim Woodruff Dam is 4,500 cfs and all basin inflow above 4,500 cfs that is capable of being stored may be stored. When transitioning from a minimum release of 5,000 to 4,500 cfs, fall rates will be limited to a 0.25 ft/day drop. The 4,500 cfs minimum release is maintained until composite storage returns to a level above the top of the Drought Zone, at which time the 5,000 cfs minimum release is re-instated. The drought plan provisions remain in place until conditions improve such that the composite storage reaches a level above the top of Zone 3 (i.e., within Zone 2). At that time, the temporary drought plan provisions are suspended, and all the other provisions are re-instated. During the drought contingency operations a monthly monitoring plan that tracks composite storage in order to determine water management operations (the first day of each month will represent a decision point) will be implemented to determine which operational triggers are applied. In addition, recent climatic and hydrological conditions experienced and meteorological forecasts will be used when determining the set of operations to utilize in the upcoming month.

Although the drought plan provides for flows lower than 5,000 cfs in the river, incorporation of provisions that allow for reduced flows during the refill period when system storage is lower and storage conservation measures when composite storage is in Zone 4 should result in fewer occasions when these low flows are triggered or in occasions where storage shortages result in flows less than 5,000 cfs.

Composite Storage Zones



United States Department of the Interior

FISH AND WILDLIFE SERVICE
Field Office
1601 Balboa Avenue
Panama City, FL 32405-3721

Tel: (850) 769-0552
Fax: (850) 763-2177

IN REPLY REFER TO:

April 18, 2008

Curtis Flakes, Chief
U.S. Army Corps of Engineers
Mobile District
Planning and Environmental Division
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Mr. Flakes:

This is in reference to the U.S. Fish and Wildlife Service's (Service) expedited amended biological opinion (BO) and conference report dated November 15, 2007 regarding the the Exceptional Drought Operations (EDO). The EDO is a modification to the Interim Operating Plan (IOP). The IOP addresses water management operations at Jim Woodruff Dam and the associated releases to the Apalachicola River. We are concerned about the recent decline in stage on the Apalachicola as measured at the Chattahoochee gage between April 11 and 14, 2008.

It is our understanding, based on conversations with Mobile staff, that the drop in river stage coincided with a drop in basin inflow. Under the EDO, "fall rates would be managed to match the fall rate of the basin inflow" (1-Nov-2007 BA for the EDO, pg 7). However, it appears from data posted on the District's web site that the unusually rapid rate did not match the described fall rate. Although we have no direct evidence of mortality of sturgeon eggs and larvae associated with the declining flows last weekend, our collection of eggs in the resulting shallow water suggests an increased risk of possible adverse effects.

The Corps' current Endangered Species Act (ESA) authorization to take listed species incidental to otherwise lawful operations of the Woodruff Dam does not include take of Gulf sturgeon, since we assumed that fall rates would match the fall rates of basin inflow. In order to ensure the Corps' continued compliance with the ESA, we will need clarification regarding the circumstances that resulted in the stage change. We also request assurances that continued operations will match the fall rate of the basin inflow and how this will be calculated and implemented.

The Corps has already re-initated consultation with us by your request submitted on April 15, 2008. The revised operations proposal is the same as the current EDO with respect to fall rates under the present hydrologic circumstances. If you determine that matching fall rates to the fall rates of basin inflow is not how you propose to operate under the new proposal, please advise us accordingly in writing.

Please call me at extension 225 if you have any questions.

Sincerely yours,

Gail A. Carmody
Field Supervisor

OFFICE OF THE GOVERNOR

BOB RILEY
GOVERNOR

STATE CAPITOL
MONTGOMERY, ALABAMA 36130

(334) 242-7100
FAX: (334) 242-0937

STATE OF ALABAMA

April 22, 2008

RECEIVED
APR 23 2008
Office of the ASA (CW)
Washington, DC

VIA FACSIMILE & U.S. MAIL

Brig. Gen. Joseph Schroedel
U.S. Army Engineer Division, South Atlantic
Room 9M15, 60 Forsyth St., S.W.
Atlanta, Georgia 30303-8801

Re: Revised Interim Operations Plan

Dear General Schroedel:

I am writing in response to the draft revision to the Interim Operations Plan (IOP) for the Apalachicola-Chattahoochee-Flint (ACF) River Basin that the Corps transmitted to the U.S. Fish & Wildlife Service on April 15, 2008. The State of Alabama opposes the draft revision in its current form.

As an initial matter, there can be little doubt that the revised IOP has been written with the primary objective of protecting water supply withdrawals by Atlanta-area entities. This reflects a stubborn refusal by the Corps to conform its activities to applicable law. As the Corps itself has stated, municipal and industrial water supply is not a congressionally authorized purpose of Lake Lanier. In addition, as the Corps has acknowledged, the water supply contracts under which virtually all water supply withdrawals were made from Lake Lanier expired in 1990, so current withdrawals are being made in the complete absence of any legal authority.

The recent decision by the United States Court of Appeals for the D.C. Circuit made clear that Congress must approve a reallocation of Lake Lanier for water supply under the Water Supply Act. The draft revised IOP endorses the de facto reallocation of water supply that the Corps has permitted at Lake Lanier without any recognition of the illegality of that reallocation.

There are many problems with the revised IOP beyond its fundamental incompatibility with legal requirements. First and foremost, the revised IOP imperils downstream interests in Alabama. Under the draft plan, the only flow target that must be met is in the Apalachicola River. Because much or all of that flow requirement could be met out of flow from the unregulated Flint River, the result could be a radical curtailment of flows in the middle Chattahoochee River under certain conditions. For example, if the requirement of 5,000 cfs in the Apalachicola River during the winter period were being met entirely out of flows from the Flint River, then all other basin inflow would have to be stored. Resulting diminution of flows in the Middle Chattahoochee could cause significant problems at the Farley Nuclear Plant and for other industry in Alabama.

Furthermore, the reduction of flows in the Middle Chattahoochee could cause substantial water quality problems as a result of the reduced assimilative capacity of the river.

The Corps has repeatedly stated that the draft 1989 water control plan is the manual by which it operates the ACF system. While Alabama does not believe that the draft manual was promulgated in accordance with law, the draft manual provides that water supply and water quality are among the purposes for which the federal projects in the system are operated. The Corps' revised IOP seems to take account of these concerns for Lake Lanier, but not for the downstream interests in Alabama.

We believe that it is essential that the Corps amend its draft revised IOP to include a flow requirement of 1850 cfs on an average weekly basis at Columbus, Georgia and 2000 cfs on a daily basis at Columbia, Alabama, even if the resulting inflows to the Woodruff project from the Chattahoochee and Flint Rivers results in a discharge to the Apalachicola River in excess of the amount otherwise designated under the IOP.

The inclusion of flow requirements in the revised IOP for the Middle Chattahoochee is also compelled by the navigation needs of the system. It is undisputed that one of the principal purposes of the ACF reservoir system, as authorized by Congress, is navigation. Each of the federal projects in the ACF has a role to play in maintaining navigability. For example, the current reservoir regulation manual for Woodruff describes Woodruff as "a multi-purpose project created primarily to aid navigation in the Apalachicola River below the dam and in the Chattahoochee and Flint Rivers above the dam and to generate electric power." Apalachicola River Basin reservoir Regulation Manual, Appendix A, Jim Woodruff Reservoir at A-10 (Rev. July 1985). To this end, the Corps is directed to maintain Woodruff at an elevation of approximately 77 MSL while continuously releasing inflows to the Apalachicola River in order to support a nine-foot deep navigation channel. *Id.* at A-16, A-17. Continuous navigation operations are to be curtailed only during unusual low-flow events, consistent with static head limitations. *Id.* at A-18.

Upstream, the Andrews Reservoir is described in its Reservoir Regulation Manual as "a single purpose project designed to aid navigation by providing a 9-foot navigation channel and by maintaining a more uniform downstream flow." Apalachicola River Basin Reservoir Regulation Manual, Appendix D, George W. Andrews Reservoir at D-5 (Rev. Feb. 1978). Because Andrews, like Woodruff, is a run-of-river project, Andrews aids navigation primarily by passing inflows released from the upstream projects. All efforts are to be made to ensure Andrew's tailwater does not drop below elevation 77 MSL—the minimum elevation needed to maintain a nine foot navigation channel. *See id.* at D-26. When Andrews can no longer support this tailwater elevation, "arrangements may have to be made for limited operation of the Walter F. George power plant, or for equivalent spillway discharges." *Id.* Indeed, all three of the upstream reservoirs—W.F. George, West Point, and Lanier—are required to support navigation from Columbus, Georgia to the Gulf of Mexico. As the Corps' 1989 Draft Water Control Plan recognizes, "all three of the major storage projects will be utilized to provide the designated level of support" for navigation "for as long as possible and, of course, preferably year-round." ACF Basin Water Control Plan at 17-18 (Draft Oct. 1989).

When the ACF reservoirs are operated to meet the elevation and flow targets specified in the Woodruff and Andrews manuals, the Farley plant's operational requirements are met. The Corps' W.F. George Reservoir Regulation Manual specifically recognizes that "Farley has an intake structure that provides cooling water for its nuclear fuel, and is dependent upon a river-stage above 76 MSL for safe operation." Apalachicola River Basin Reservoir Regulation Manual, Appendix C, Walter F. George Dam at C-13 (Feb. 1993)._ When the navigation channel is properly maintained, these elevation and flow targets also ensure access to and from the Farley plant by water. The Farley plant was specifically designed and built on the assumption that the Corps would operate the ACF Reservoirs to ensure a minimum elevation of 76 MSL between Andrews and Woodruff, where Farley is located, for as much of the year as possible.

Notwithstanding these clear requirements contained in the manuals governing the ACF projects, the revised IOP simply ignores the navigation issue altogether. By placing the focus on Lake Lanier and on flows in the Apalachicola River, the interests in the Middle Chattahoochee are forgotten, left to hope that the other requirements of the revised IOP will fortuitously provide for them. This is not a situation that Alabama can accept.

We also have significant concerns pertaining to the use of composite basin storage as defined in the draft revised IOP. The focus of the Corps on the protection of Lake Lanier to the detriment of the downstream interests is underscored by the definition of the drought zone as the inactive storage in Lanier, West Point, and W.F. George, plus Zone 4 at Lanier only. Of even greater concern is the dependence on action zones for setting flow at Woodruff because Lake Lanier dominates the zone-based approach. The revised IOP lacks any provisions to deal with a scenario when Lanier is relatively full but West Point and Eufaula are at a relatively low level. For example, if Lanier is in Zone 1, then the composite storage will almost certainly show the system as healthy. Yet, West Point and W.F. George could be almost empty at the same time, and the revised IOP would still call for high releases. The draft revised IOP must be remedied to address these concerns.

At bottom, it appears as though the interests and needs of Alabama in the ACF have been virtually forgotten in the preparation of the revised IOP. The Corps needs to step-back and conduct a thorough assessment of the effects of its draft on these interests. I will make Alabama's technical team available to your staff to facilitate your review.

Sincerely,

Bob Riley
Governor of Alabama

BR/ps/kw

cc: Honorable Dirk Kempthorne
Honorable James Connaughton
Honorable John Paul Woodley
Lt. Gen. Robert Van Antwerp

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

REPLY TO
ATTENTION OF:

April 24, 2008

Inland Environment Team
Planning and Environmental Division

Ms. Gail Carmody
Field Supervisor
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, Florida 32405-3721

Dear Ms. Carmody:

This is in response to your letter of April 18, 2008 regarding the recent decline in river stage on the Apalachicola River as measured at the Chattahoochee gage between April 11 and 14, 2008. In that letter, you requested: 1) clarification regarding the circumstances that resulted in the stage change; 2) assurances that continuing operations will adhere to the fall rate analyzed and approved in the biological opinion (BO) for the Exceptional Drought Operations (EDO) temporary modification of the Interim Operations Plan (IOP) at Jim Woodruff Dam; 3) clarification on how the fall rate will be calculated and implemented; and 4) notice of any changes to the recently submitted modified IOP proposal resulting from this event.

As noted in your letter, we are currently operating under the provisions of the EDO regarding releases from Jim Woodruff Dam. Under these provisions, the IOP maximum fall rate schedule is suspended and fall rates are managed to match the fall rate of the basin inflow (BI). Please note that the EDO does not require a match of the volume of water, but rather a match of the rate of change when releases are being reduced. This technique considers the change in 1-day BI on the falling limb of a rain event, and the fall rate is calculated by measuring the difference between the daily BI of consecutive calendar days. Similar to the IOP fall rate, the fall rate can be measured in feet per day (ft/day) by converting the 1-day BI to an elevation using the Chattahoochee stage-discharge rating curve. The difference in elevation as the basin inflow decreases is defined as the 1- day basin inflow fall rate. The 1-day BI values used to determine the fall rate are calculated by summing the daily local inflows at Buford, West Point, Walter F. George, and Jim Woodruff dams. However, the West Point, Walter F. George, and Jim Woodruff local calculations incorporate a 3-, 2-, and 1-day lag respectively due to the large size of the basin and resultant travel times. The 1-day BI and local values are available on the water management website at the following location: http://water.sam.usace.army.mil/locals-7-day.htm. As noted in the BO for the IOP, managing fall rates to conform to specific values is a difficult undertaking at Woodruff Dam when flow rates exceed the release capacity of the powerhouse, which is about 16,000 cubic feet per second (cfs). Releases greater than 16,000 cfs require the use of spillway gates in addition to the turbines, and require an operator to open or close the gates using a rail-mounted crane on the crest of the dam. The water discharge openings of the gates are not fully adjustable and inclement weather, floating debris from the reservoir, and other factors often complicate the procedure of opening and closing the gates. Fall rates are relatively more manageable when releases are less than 16,000 cfs and controlled by the powerhouse, but this control is also not a precise operation. This is the reason the IOP maximum fall rate schedule describes a lower and upper maximum fall rate rather than specific values.

We are also currently operating to support fish spawn at the projects and in the Apalachicola River. As described in the February 2005 Draft Standard Operating Procedures (SAM-SOP-1130-2-9) for reservoir regulation and coordination for fish management purposes, the U. S. Army Corps of Engineers (Corps) operates for generally stable or rising reservoir levels and generally stable or gradually declining river stages on the Apalachicola River, for approximately 4 to 6 weeks during the designated spawning period for the specified project area. Generally stable or rising levels are defined as not lowering the reservoir levels by more than 6 inches, with the base elevation generally adjusted upward as levels rise due to increased inflows or refilling of the reservoir. Generally stable or gradually declining river stages are defined as ramping down of ½ foot per day or less.

The unusually rapid fall rate experienced between April 11 and 14 was a result of several factors. The EDO was designed to maximize refill potential in the storage reservoirs in an attempt to gain sufficient storage to support the many needs within the basin throughout the continuing drought. Although refill at Lake Lanier has been limited over the winter, Walter F. George and West Point Lakes have refilled due to hydrologic conditions and project operations. As you know, Lake Seminole has essentially no storage. During the month of April, West Point and Walter F. George have been full or in the flood pool. The Corps has accepted this additional risk because of the persistent drought conditions in the upper basin. Significant rainfall (2-7 inches) occurred in the lower basin on April 4-5 (Figure 1). As depicted in Figure 2, this rainfall resulted in increased outflows from Jim Woodruff Dam on April 5-6 from approximately 15,000 cfs to 35,000 cfs (change in stage of approximately 8 feet). The location of the rainfall in the lower basin coupled with a lack of available storage in the lower Corps projects reduced Corps flexibility to store water and re-shape the hydrograph. Consequently, on April 11-13, a roughly equivalent decrease in discharge and river stage occurred as water managers adjusted the releases in response to the rapidly dropping BI. This reduction in discharge was accomplished by incrementally reducing the number of spillway gate openings from step 7, to step 5, to step 0. Figure 2 also illustrates the time line of our operations regarding spillway gate settings.

Figure 3 illustrates a comparison of the Apalachicola River flows, measured at the Chattahoochee gage, to the 1-day basin inflow from March 24 to April 22, 2008. Analysis of the falling limb of the peak event for the two curves provides a comparison of the 1-day BI and Jim Woodruff release fall rates (falling slopes). Although there is a delay regarding the timing of the peak due to the location of the rainfall and actual water travel time versus BI calculation, the discharge fall rate generally matches the 1-day BI fall rate. However, it appears that the discharge fall rate was slightly higher than the 1-day BI fall rate between the afternoons of

April 12 - 13. The decision to reduce releases from Jim Woodruff Dam was based on the hydrologic conditions experienced, a continuing need to maximize storage, and constraints regarding the spillway gate operations. This decision resulted in an inability to meet the provisions of SAM-SOP-1130-2-9. However, the SOP recognizes that droughts and floods within the basin present specific water management challenges that may limit our ability to meet both the reservoir and river spawning provisions. The water managers did not intend to violate the fall rate provisions of the EDO.

Due to the high importance of water management on the Apalachicola-Chattahoochee-Flint (ACF) basin, coupled with the recent loss of highly experienced personnel, several interim management controls have been implemented to insure the best operation possible at Jim Woodruff Dam and the upstream reservoirs. Firstly, the Chief of the Hydrology and Hydraulics Branch has assigned both a primary and secondary Basin Manager to the ACF. Subject to availability, the two Water Managers will jointly agree on operational decisions. Secondly, once an operational decision is made, the proposed operation will then be subject to review by a Senior Water Manager familiar with the ACF basin and Jim Woodruff Dam operations. Finally, all major operational decisions will be approved by either the Chief of the Hydrology and Hydraulics Branch, or his designated representative.

A review of fall rate data over the last 90 days indicates that detailed fall rate monitoring is most critical following rainfall events that result in BI and Jim Woodruff discharge greater than 30,000 cfs. As described in the IOP maximum fall rate schedule, fall rate maintenance does not occur when releases are greater than 30,000 cfs. However, fall rates are managed once BI and corresponding releases drop below 30,000 cfs . Additionally, there are periods when Jim Woodruff discharge increases (rises) when the basin inflow is decreasing (falling). In other words, the basin outflow may increase as the basin inflow decreases. This typically occurs during periods exhibiting rapid changes in the BI. In most cases, the 1-day basin outflow (Jim Woodruff release) rate of change both falling and rising is more gradual than the 1-day BI rate of change. In order to ensure this occurs, the Basin Manager will use hydrograph comparisons to monitor the fall rates. While operating under the EDO or the drought contingency plan incorporated into the recent IOP modifications proposal, a visual comparison between the 1-day BI and Jim Woodruff release fall rates will be performed daily when releases are less than 30,000 cfs to ensure they are reasonably consistent. If necessary, the Basin Manager will also convert the BI fall rate analysis to feet/day using the Chattahoochee gage latest stage-discharge rating (Figure 4).

While at this time we do not recommend any changes to the recent IOP modifications proposal, we are considering, as part of the Water Control Manual update process, including additional language in the Jim Woodruff Dam Water Control Manual regarding Gulf sturgeon spawning behavior and early life cycle requirements. Although this supplemental information will not result in additional provisions regarding releases during the spawning season, it will be readily available for quick reference when system conditions and local hydrology result in the need to adjust releases significantly from standard spawning season operations.

We appreciate your continued cooperation regarding operations at Jim Woodruff Dam in support of endangered and threatened species during the recent exceptional drought period and persisting drought. Should you have any questions, comments, or recommendations, please contact Mr. Brian Zettle, (251) 690-2115, Email: brian.a.zettle@sam.usace.army.mil.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosures

Figure 1.

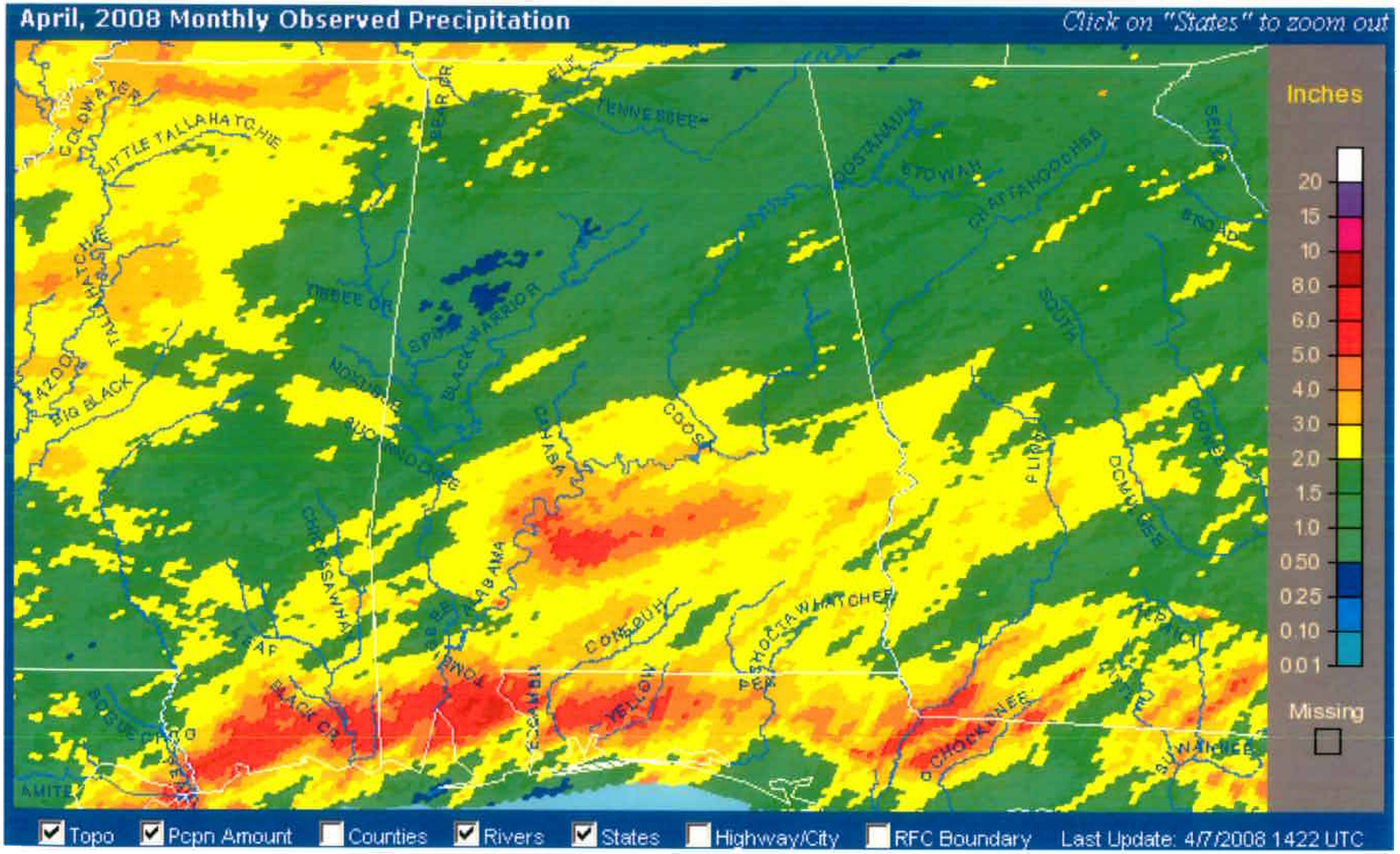

April, 2008 Monthly Observed Precipitation
Click on "States" to zoom out
Inches
20
15
10
8.0
6.0
5.0
4.0
3.0
2.0
1.5
1.0
0.50
0.25
0.10
0.01
Missing
TENNESSEE
LITTLE TALLAHATCHIE
BEAR CR
OOSTANAULA
ETOWAH
CHATTAHOOCHEE
BLACK WARRIOR
TIBBEE CR
BIG BLACK
SOUTH
CAHABA
COOSA
FLINT
OCMULGEE
ALABAMA
CHICKASAWHAY
CHOCTAWHATCHEE
CONECUH
LEAF
BLACK CR
ESCAMBIA
YELLOW
CHOCKAHEE
AMITE
Topo
Pcpn Amount
Counties
Rivers
States
Highway/City
RFC Boundary
Last Update: 4/7/2008 1422 UTC

Figure 2.

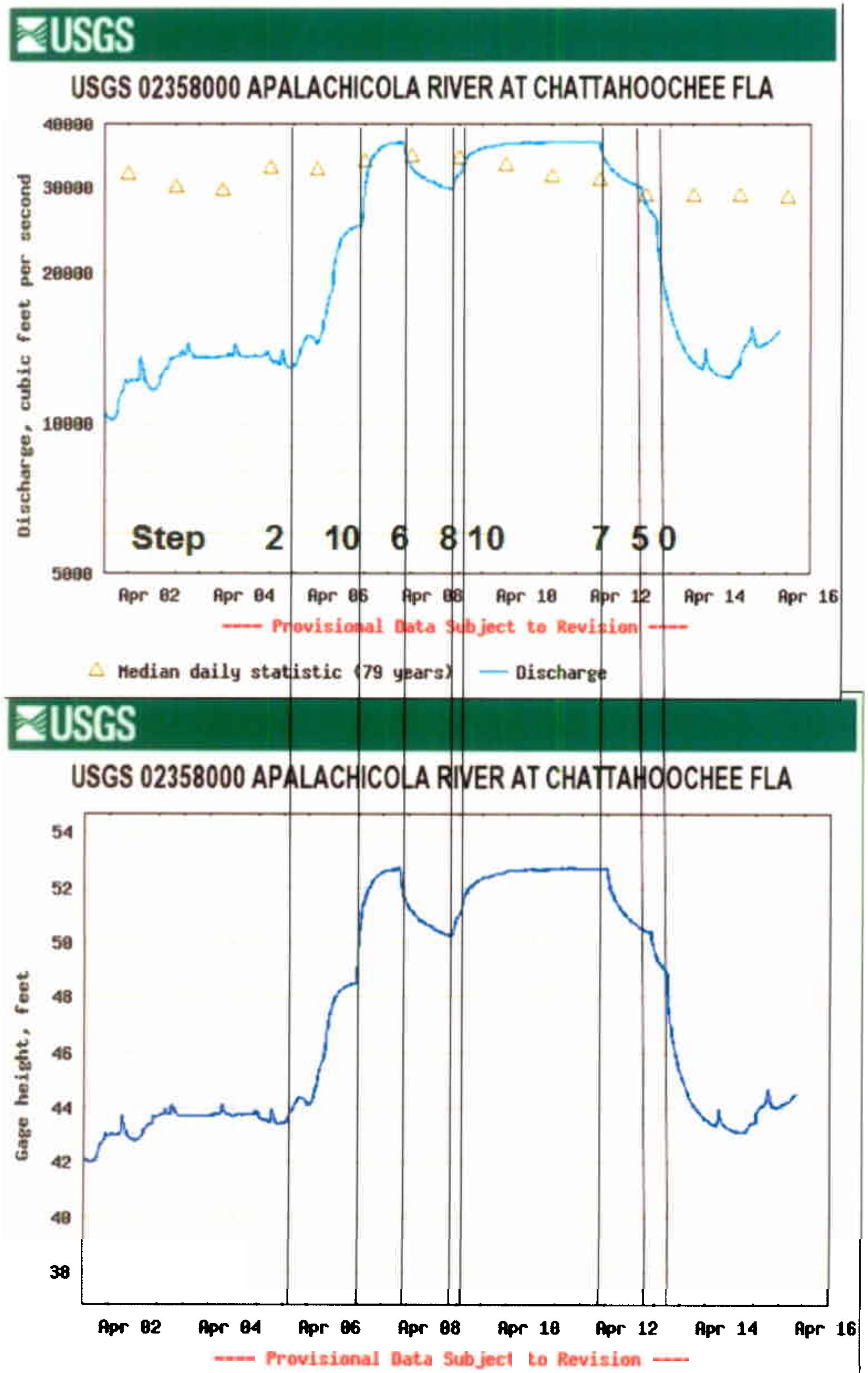
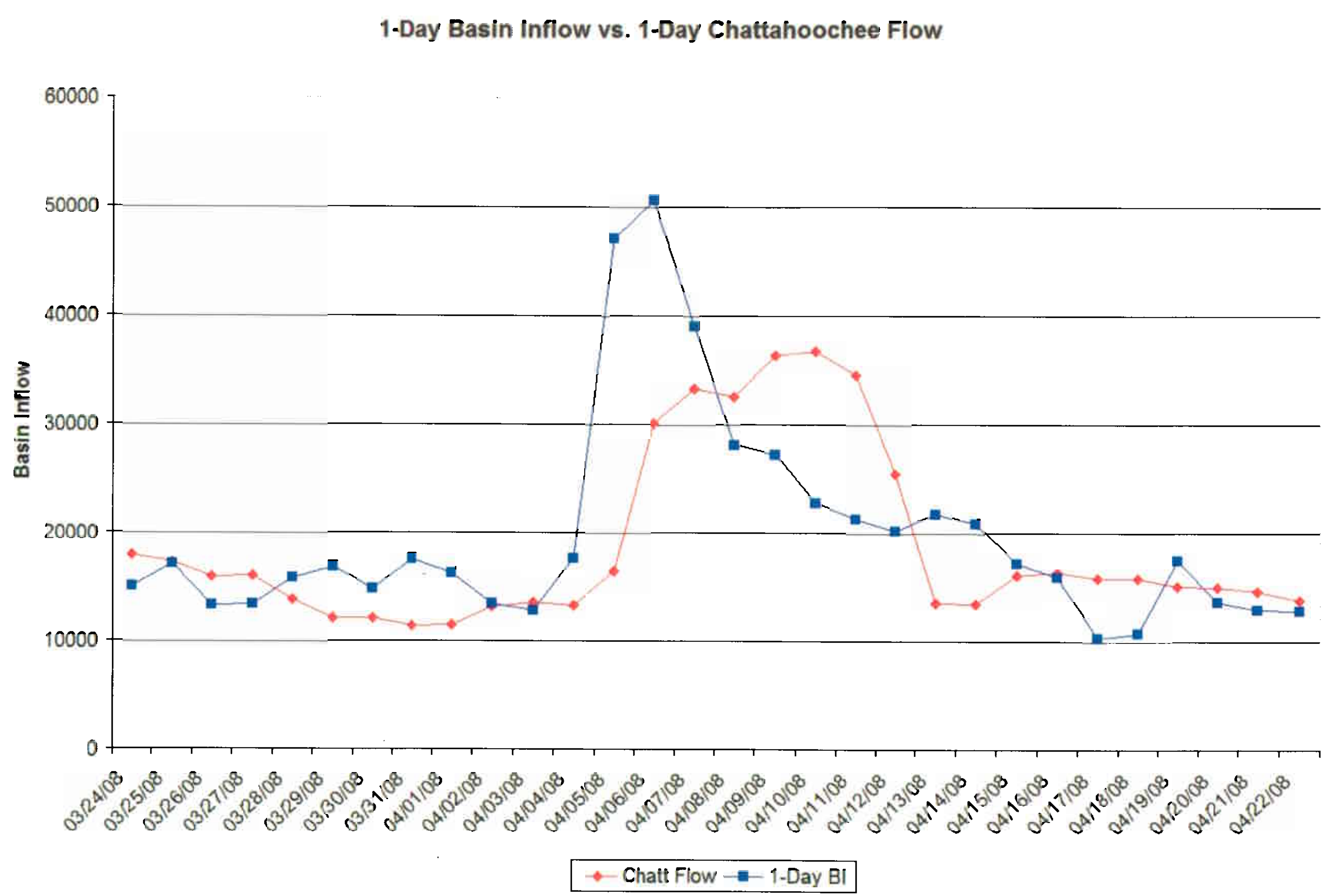

USGS
USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA
Discharge, cubic feet per second
40000
30000
20000
10000
5000
Step 2 10 6 8 10 7 5 0
Apr 02
Apr 04
Apr 06
Apr 08
Apr 10
Apr 12
Apr 14
Apr 16
---- Provisional Data Subject to Revision ----
Median daily statistic (79 years)
Discharge
USGS
USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA
Gage height, feet
54
52
50
48
46
44
42
40
38
Apr 02
Apr 04
Apr 06
Apr 08
Apr 10
Apr 12
Apr 14
Apr 16
---- Provisional Data Subject to Revision ----

Figure 3.



1-Day Basin Inflow vs. 1-Day Chattahoochee Flow
Basin Inflow
60000
50000
40000
30000
20000
10000
0
03/24/08
03/25/08
03/26/08
03/27/08
03/28/08
03/29/08
03/30/08
03/31/08
04/01/08
04/02/08
04/03/08
04/04/08
04/05/08
04/06/08
04/07/08
04/08/08
04/09/08
04/10/08
04/11/08
04/12/08
04/13/08
04/14/08
04/15/08
04/16/08
04/17/08
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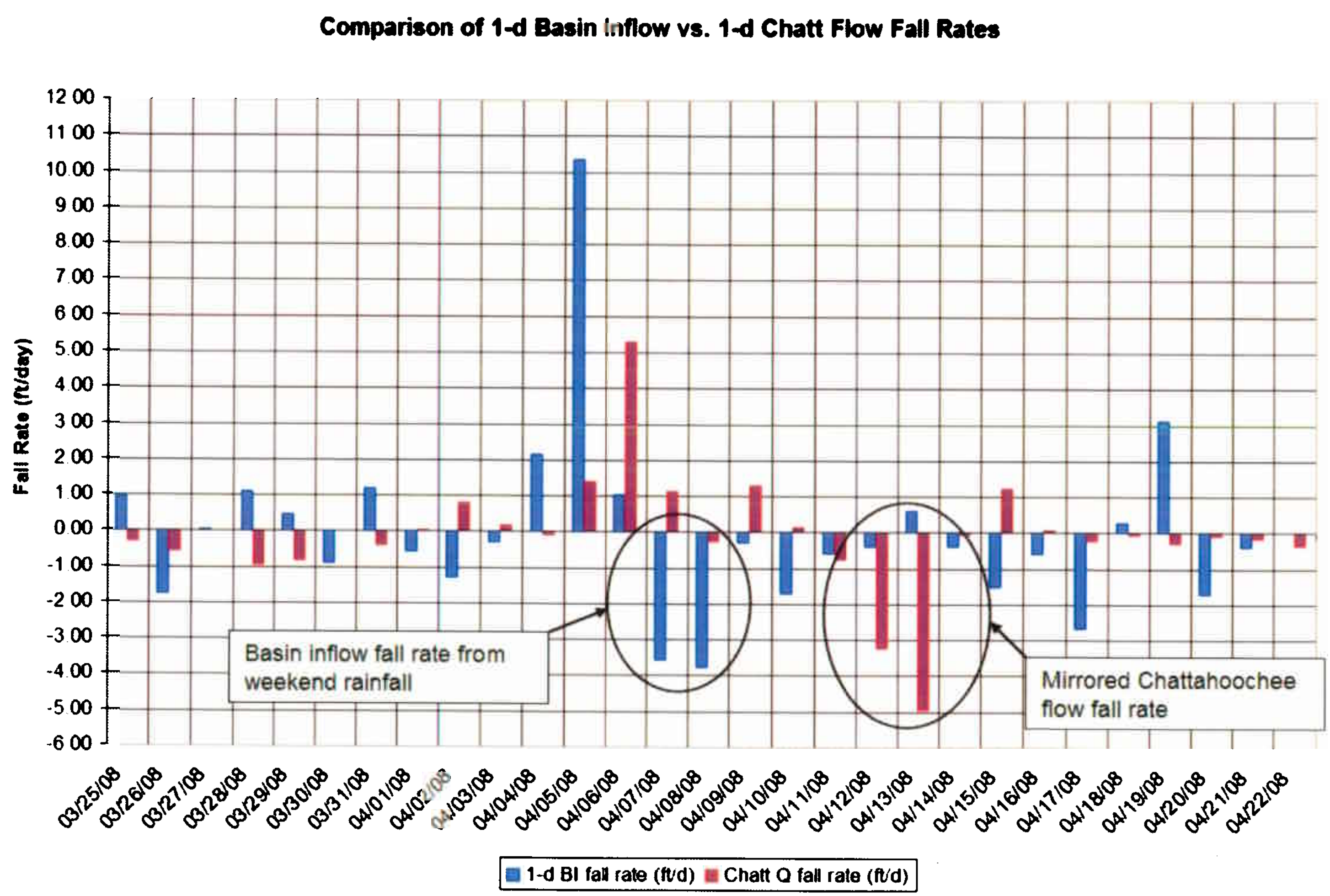
04/19/08
04/20/08
04/21/08
04/22/08
Chatt Flow
1-Day BI

Figure 4.



Comparison of 1-d Basin Inflow vs. 1-d Chatt Flow Fall Rates
Fall Rate (ft/day)
12.00
11.00
10.00
9.00
8.00
7.00
6.00
5.00
4.00
3.00
2.00
1.00
0.00
-1.00
-2.00
-3.00
-4.00
-5.00
-6.00
03/25/08
03/26/08
03/27/08
03/28/08
03/29/08
03/30/08
03/31/08
04/01/08
04/02/08
04/03/08
04/04/08
04/05/08
04/06/08
04/07/08
04/08/08
04/09/08
04/10/08
04/11/08
04/12/08
04/13/08
04/14/08
04/15/08
04/16/08
04/17/08
04/18/08
04/19/08
04/20/08
04/21/08
04/22/08
Basin inflow fall rate from weekend rainfall
Mirrored Chattahoochee flow fall rate
1-d BI fall rate (ft/d)
Chatt Q fall rate (ft/d)

PD- EI /Zettle
Cy PD-F
EN-H

Columbus
Water
Works

Serving our Community
Protecting the Environment

April 25, 2008

Col. Byron G. Jorns, District Commander
Mobile District, U.S. Army Corps of Engineers
ATTN: CESAM-DE
P.O. Box 2288
Mobile, Alabama 36628-0001

Re: Proposed Modification to IOP for Jim Woodruff Dam

Dear Colonel Jorns:

The City of Columbus, Georgia, and Columbus Water Works ("Columbus") write to express their concern regarding the Corps of Engineers' proposed modification to the Interim Operations Plan ("IOP") at Jim Woodruff Dam. As described in the Corps' April 15, 2008 request for formal consultation with the U.S. Fish and Wildlife Service ("FWS") under Section 7 of the Endangered Species Act, this modification adds a drought contingency plan to the IOP and increases the percentage of basin inflow that may be stored in the system under certain conditions. Columbus strenuously objects to any IOP modification that does not provide for specified minimum instream flows at gages on the Middle Chattahoochee, including West Point, Columbus, and Walter F. George Lock & Dam.

The Georgia Power Projects above Columbus are required in their Federal Energy Regulatory Commission ("FERC") licenses to provide 1,850 cfs weekly average, 1,350 cfs daily average, and 800 cfs instantaneous minimum flows at Columbus. The same daily and weekly average flow requirements were embodied in the Memorandum of Understanding Regarding the Initial Allocation Formula for the ACF River Basin entered into by Florida, Georgia, and Alabama in July 2003. Columbus requires these flows to meet its assimilative needs as a discharger of treated municipal waste water. Columbus's NPDES permit for its wastewater discharges assumes a "critical low flow" in the Chattahoochee at Columbus of 1150 cfs.

In its November 1, 2007 request for Section 7 Consultation on the Emergency Drought Operation ("EDO") plan currently in effect for operations at Woodruff Dam —a drought plan similar to the one incorporated in the proposed IOP modification— the Corps stated that under the EDO, "critical basin water resource needs would continue to be met," including "wastewater assimilation for water quality." Despite these assurances, on at least two occasions since the EDO went into effect (January 8 and January 9, 2008), daily average flows at Columbus have fallen well below the FERC license requirements and below the "critical low flow" of 1150 cfs — even though inflows to West Point Lake during this time were ample to meet those flow requirements. Columbus experienced similar low flow periods in 2006 and 2007.

Columbus is gravely concerned that, without any provision for in the IOP (or in any new Water Control Plan) for guaranteed minimum flows at Columbus, these incidents of low flow will recur, adversely affecting Columbus's ability to provide wastewater treatment services to its citizens and a significantly expanded Ft. Benning in an economical fashion. We urge the Corps to amend the proposed IOP modification to incorporate guaranteed minimum flows at Columbus.

Sincerely,

Billy Turner
President

cc: Curtis Flakes, Chief
Gail Carmody
Dr. Carol Couch
Harry Vernon, Chairman
Philip Thayer, Treasurer
Billy Blanchard
Dr. Carol Rutland
Mayor Jim Wetherington

Florida Department of
Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

April 30, 2008

Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Ave.
Panama City, FL 32405-3721

Mr. Curtis M. Flakes
Chief, Planning and Environmental Division
Mobile District
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001

RE: Endangered Species Act Section 7 Consultation on Proposed Revision to the Interim Operations Plan

Dear Ms. Carmody and Mr. Flakes:

The State of Florida strongly opposes the U.S. Army Corps of Engineers' ("Corps") proposed revision to the Interim Operations Plan ("Revised IOP") as articulated in Mr. Flakes' letter dated April 15, 2008. The Revised IOP suffers many of the same flaws as the Extraordinary Drought Operations ("EDO") Florida earlier opposed in November 2007, and under some conditions, this latest IOP will be far worse. Florida rejects any proposal that reduces minimum flows below 5,000 cfs and so dramatically compromises spawning on the River. While the Corps' stated goal is to minimize adverse impacts to federally listed species, the Corps proposes an unprecedented reduction in spring spawning flows that are absolutely critical to the long-term health of the Apalachicola River ecosystem. Not only do such flows support Gulf sturgeon spawning, they are key to mussel host-fish reproduction and to salinity regulation in Apalachicola Bay. As currently configured, the Revised IOP will jeopardize and take Gulf sturgeon and mussels, and will adversely modify critical habitat of both species. The Fish and Wildlife Service ("Service") must impose a reasonable and prudent alternative to the Revised IOP. Information included herein is designed to assist in that endeavor.

If implemented, the Revised IOP, like the EDO, would starve the Apalachicola River and Bay of freshwater flows needed to sustain those ecosystems and the species and economies dependent on them. By allowing the Corps to store *all* Basin Inflow above 5,000 cfs (or 4,500 cfs in some cases) in Georgia any time Composite Storage is in Zone 4, and to continue storing all flows above 5,000 until Composite Storage Zone 2 is reached, the Revised IOP will dramatically reduce downstream river flows. Moreover, even when Composite Storage is in Zone 1, the Revised IOP would reduce the frequency and magnitude of higher flows needed for floodplain inundation key to the vitality of the Apalachicola River floodplain. This would continue unprecedented declines in River levels and cause irreparable harm to Gulf sturgeon and federally protected mussel populations.

The past month has provided a prime example of the problem presented by the Corps' decision to capture all available Basin Inflow above minimum flow requirements. From April 12 - 14, in compliance with the EDO, the Corps dropped River flows from over 35,000 cfs to less than 13,000 cfs just as Gulf sturgeon had initiated their spawn.[1] In all likelihood, many sturgeon eggs were lost during that operation. The only thing that prevented the Corps from dropping flows even further appears to be the timely intervention of biologists from the Service and Florida Fish and Wildlife Conservation Commission who convinced the Corps to protect extant eggs as they were hatching out.

Gulf sturgeon require a stable flow to ensure spawning success. Operations that rapidly reduce flows over spawning grounds during the spawn strand eggs and kill larval fish. Historically, the Corps and Service have taken the position that the Corps would not be culpable for such events, provided the Corps was releasing to the River all Basin Inflow required to support spawning.[2] Florida strongly disagrees with that position. Beyond that dispute, however, under the Revised IOP, the Corps will actively retain Basin Inflow (e.g., any time Composite Storage is in Zone 4 and under certain

[1] To the extent the Corps' "Standard Operating Procedure" limited the Corps' ability to provide higher flows, Florida continues to object to the implementation of any such "procedure" designed expressly to maintain static reservoir levels to accommodate sport fish at the expense of threatened Gulf sturgeon.

[2] The Service has indicated it believes the Corps may only be found liable for "take" when it is increasing storage and flows in the River are reduced below Basin Inflow. *See, e.g.*, 2006 Biological Opinion at 140 ("Take of listed species due to the IOP may occur when the Corps is increasing total storage in ACF reservoirs while releasing a discharge that either exposes listed mussels or isolates them from flowing water."); *Id.* at 142 ("Take of listed species due to the IOP may occur when the Corps is using a portion of basin inflow to increase ACF reservoir storage."). Florida consistently has opposed this narrow and erroneous interpretation of the Corps' obligations under the Endangered Species Act and continues to do so. However, the Revised IOP moots the debate. The Corps has stated its unequivocal intent to increase storage by reducing River flows below Basin Inflow whenever Composite Storage is in Zone 4. Such operations result in an impermissible take under any possible interpretation, including the Service's prior interpretation.

inflow sharing provisions) and prevent access to spawning grounds and/or lower River elevations at key spawning habitats to the detriment of the species. This radical departure from long-held practice places legal responsibility for resulting "take" squarely on the Corps.

Turning to the low flow parameters of the Revised IOP, Florida does not support any reduction below 5,000 cfs simply because models demonstrate Composite Conservation Storage *may* be depleted. The Corps lacks authority to operate Lake Lanier principally for water supply purposes. *Southeastern Federal Power Customers, Inc. v. Peter Geren, Secretary of the U.S. Department of the Army et al.*, No. 06-5080, slip op. at 16-17 (D.C. Cir. Feb. 5, 2008) (motion for rehearing pending). Moreover, the Corps recently concluded that water quality in the Inactive Pool of Lake Lanier would support drinking water uses. *See Environmental Assessment, Georgia Environmental Protection Division Proposal for a Temporary Reduced Minimum Water Quality Flow Requirement in the Chattahoochee River at Peachtree Creek for Drought Contingency Water Management Operation in the ACF River Basin and Temporary Waiver from ACF Water Control Plan* (March 2008) at EA-42 – 43. Bottom line, nearly half of Lake Lanier stored water is currently available, but is not being factored in, and therefore there is no threat to municipal and industrial demands.

Accordingly, there is simply no legitimate (and certainly no legal) basis for curtailing Apalachicola River flows to unprecedented lows, just to maintain Lake Lanier elevations above 1035' (the top of the Inactive Pool). The only relevance of elevation 1035 at this time is hydropower support. Yet, the Corps' Memorandum of Understanding with the Southeastern Power Administration makes very clear that the Corps is not responsible for generating or delivering hydropower during times of "drought" or when doing so would "conflict with the statutory requirements for the operation of said projects with regard to fish and wildlife[.]" MOU §§ 3(c)(2); 8. Certainly, any time the Corps is prepared to "take" threatened and endangered mussels by cutting Apalachicola River flows to unprecedented levels, Florida assumes the Corps will have determined the Basin to be in "drought" sufficient to excuse a temporary interruption of hydropower production. In short, there is no requirement to generate hydropower during droughts, and more of the 1.8 million acre feet historically preserved in Composite Storage should be made available for minimum flow support.

Florida's concerns about the Revised IOP extend beyond its impact on the River to its potentially disastrous effects on Apalachicola Bay. Florida biologists observed high salinities and corresponding oyster mortality throughout the summer of 2007 – at a flow of 5,000 cfs. As you know, salinity and temperature in the Bay are a function of freshwater inflow; the higher the freshwater inflow, the lower the salinity and temperature. The salinity charts attached as Exhibits A, B, C, D, and E show the extraordinarily high salinities experienced last summer, along with a pattern of increasing salinities corresponding to the Corps implementation of the IOP in spring 2006. You also will see that salinities declined significantly in the early part of 2008 as spring rains returned to the lower ACF Basin. Although it is too early to know, we anticipate these reduced salinities aided the oysters' plight. Yet, a swift reduction in flows for another prolonged period, as dictated by the Revised IOP, would set oyster populations back on a path to decimation. <u>This would starve the Apalachicola River and Bay of freshwater flows needed to keep the ecosystems, species, and economy alive.</u>

The Bay also provides habitat for juvenile Gulf sturgeon, which overwinter in lower salinity sections of the Bay. The Service has recognized "Corps operations affect freshwater flow into the bay, which affects salinity regimes and habitat conditions for Gulf sturgeon and their estuarine feeding habitats." 2006 BiOp at 40. "Research ... indicates that subadult Gulf sturgeon show a preference for ... salinity less than 6.3 parts per thousand. " *See Biological and Conference Report on the U.S. Army Corps of Engineers, Mobile District, Interim Operations Plan for Jim Woodruff Dam and the Associated Releases to the Apalachicola River* (Sept. 5, 2006) ("2006 BiOp") at 21 (citations omitted); *Id.* at 23. The Revised IOP will increase salinities in this important zone and compromise the availability of these habitats, which have been designated, along with the River, as "critical" under the ESA. "Juvenile Gulf sturgeon cannot survive direct transition from fresh water into salinities greater than 30 parts per thousand (ppt) ... ." 2006 BiOp at 112. As shown in the attached salinity charts, operations under the IOP and EDO during 2007 resulted in elevated salinities well over 30 ppt. The Service's earlier conclusion that the IOP would not "worsen" the status of estuarine habitats was incorrect, and the Service cannot continue to overlook the adverse impact of extreme low flows on the Bay resulting from recent and planned Corps operations.

Finally, your agencies continue to disregard the loss of 400-600 cfs occasioned by its shifting the point of flow measurement from Woodruff Dam downstream to the Chattahoochee gauge. The Service never has analyzed the real impact of this loss, perhaps because the Corps refuses to view this as a significant issue. However, as Florida has repeatedly stated, the loss of 400-600 cfs resulted in the disconnection of key habitats the Corps previously committed to protect (e.g., Swift Slough). *See, e.g., U.S. Fish and Wildlife Service, Recovery Plan for Endangered Fat Threeridge, Shinyrayed Pocketbook, Gulf Moccasinshell, Oval Pigtoe and Threatened Chipola Slabshell, and Purple Bankclimber* (2003) at 88 (discussing Corps' assurance that 5,000 cfs - *measured at Woodruff Dam* - would maintain a connection between the River and Swift Slough). It is time the Service evaluated the impact of this discretionary change by the Corps.

For the reasons outlined above, the Revised IOP is not considered to provide a balanced operational regime that addresses the needs of Florida's ecology and economy during routine operations, nor does it establish an equitable shared adversity during times of drought. It should be revised to incorporate the concerns that Florida repeatedly has brought before your agencies. Should you have any questions or wish to discuss these issues further, I will make myself or my staff available as needed.

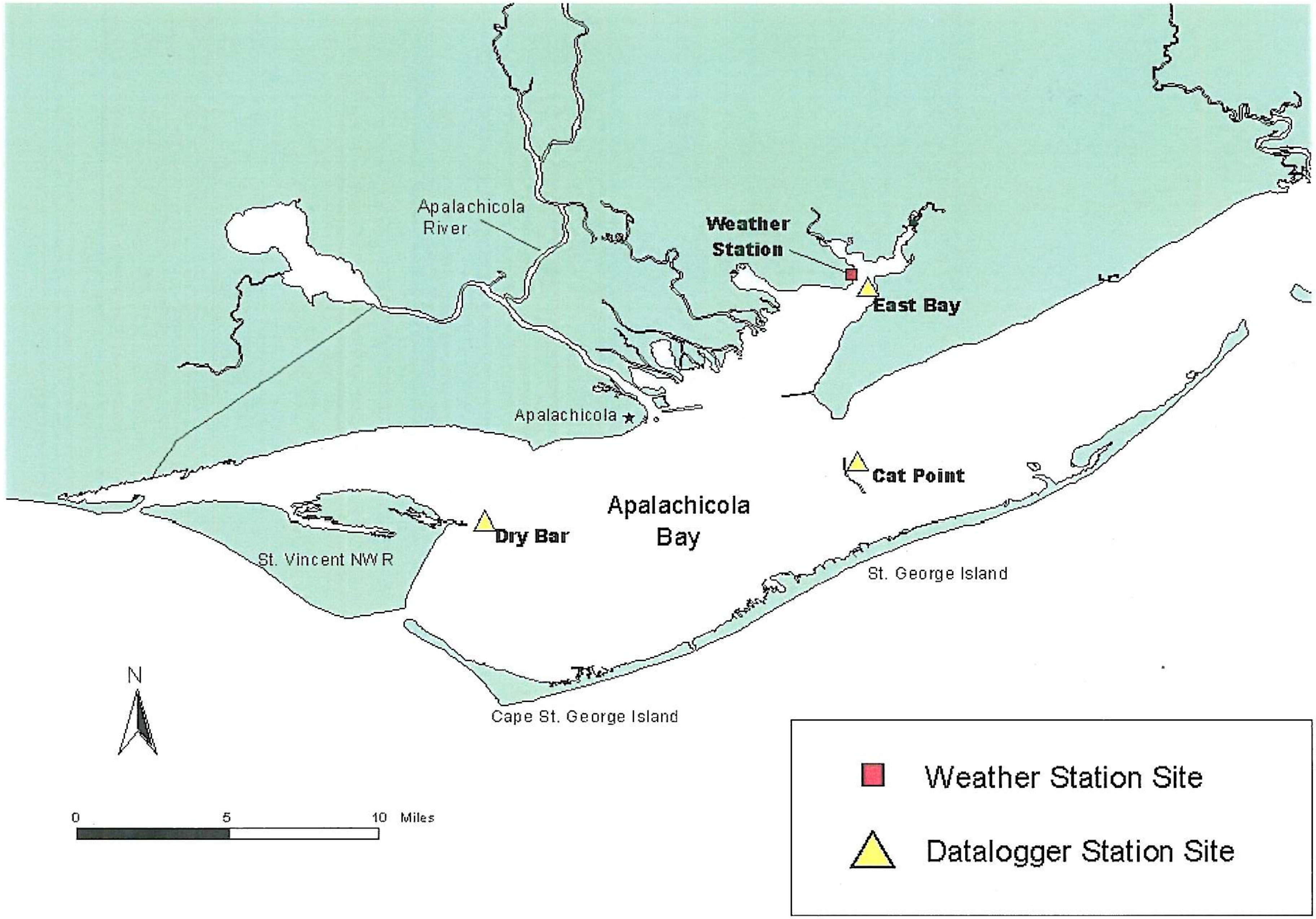
Sincerely,

Michael W. Sole
Secretary

MWS/tb

Enclosures (5)

cc Hon. Dirk Kempthorne, Secretary, U.S. Department of Interior
Lt. Gen. Robert L. Van Antwerp, Commander, U.S. Army Corps of Engineers
Col. Byron Jorns, District Commander, U.S. Army Corps of Engineers
Mr. Dale Hall, Director, U.S. Fish and Wildlife Service
Mr. Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service
Brig. General Joe Schroedel, U.S. Army Corps of Engineers



Location of datalogger deployment sites and weather station site.

Exhibit A

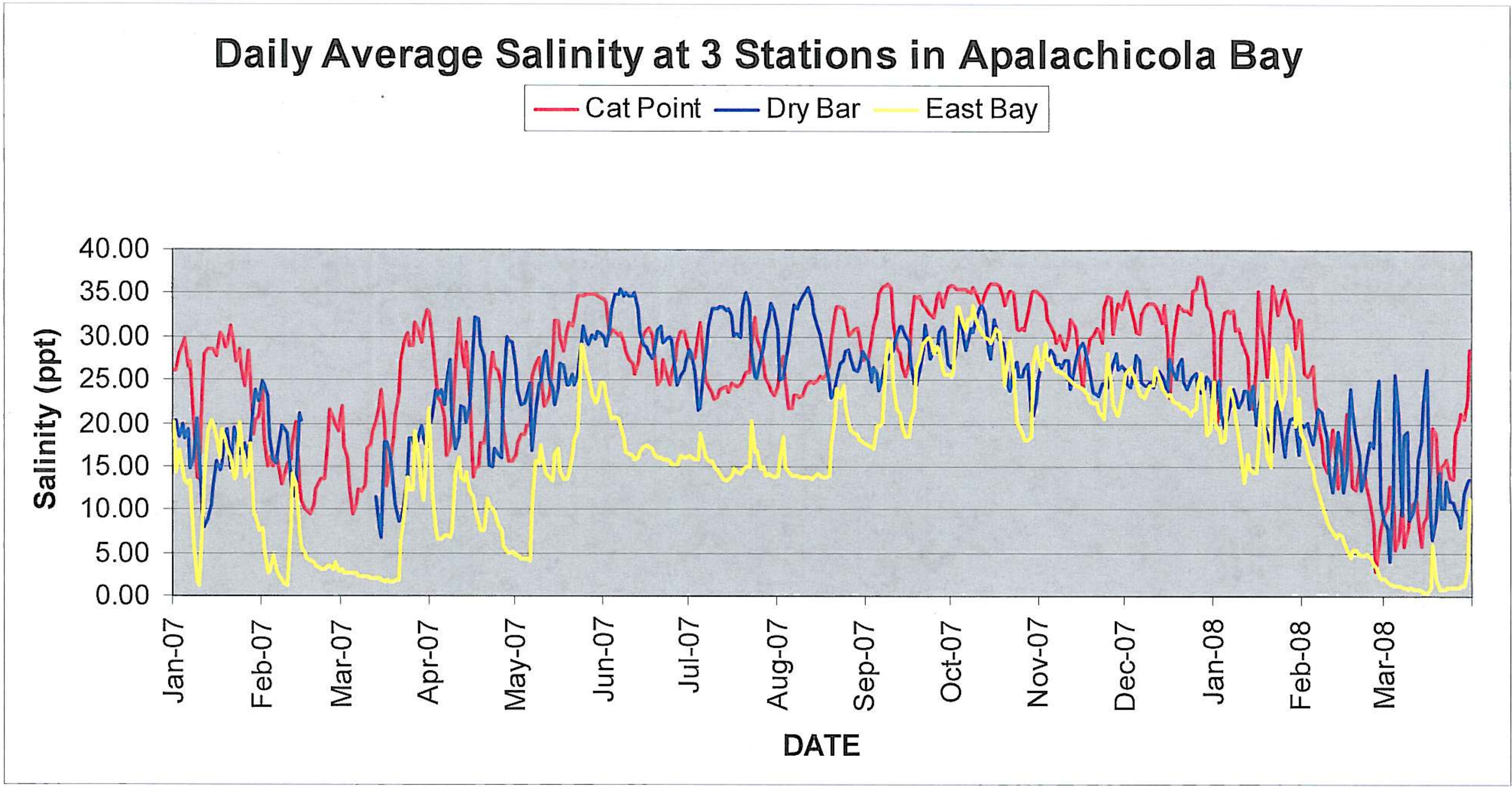
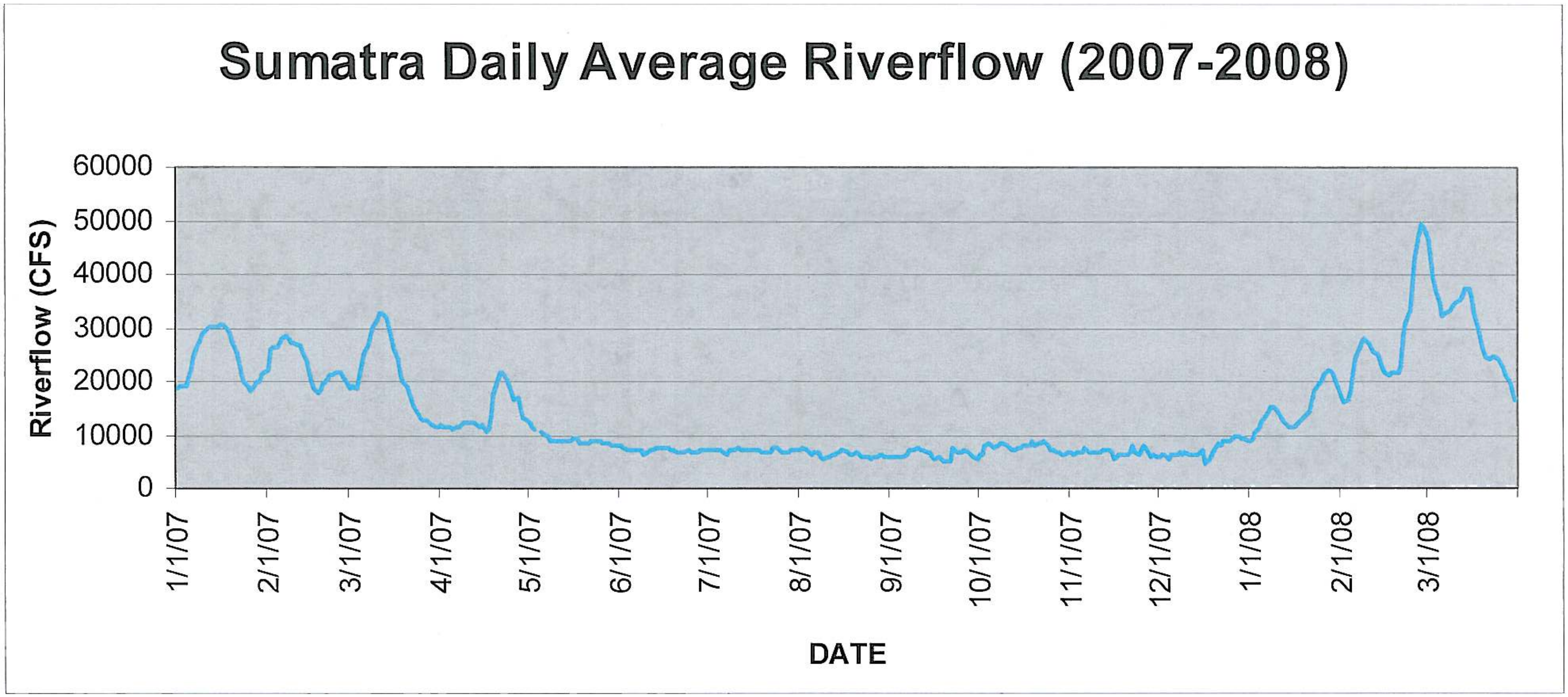

Daily Average Salinity at 3 Stations in Apalachicola Bay
Cat Point
Dry Bar
East Bay
Salinity (ppt)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Jan-07
Feb-07
Mar-07
Apr-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
DATE

Exhibit B



Sumatra Daily Average Riverflow (2007-2008)
Riverflow (CFS)
60000
50000
40000
30000
20000
10000
0
1/1/07
2/1/07
3/1/07
4/1/07
5/1/07
6/1/07
7/1/07
8/1/07
9/1/07
10/1/07
11/1/07
12/1/07
1/1/08
2/1/08
3/1/08
DATE

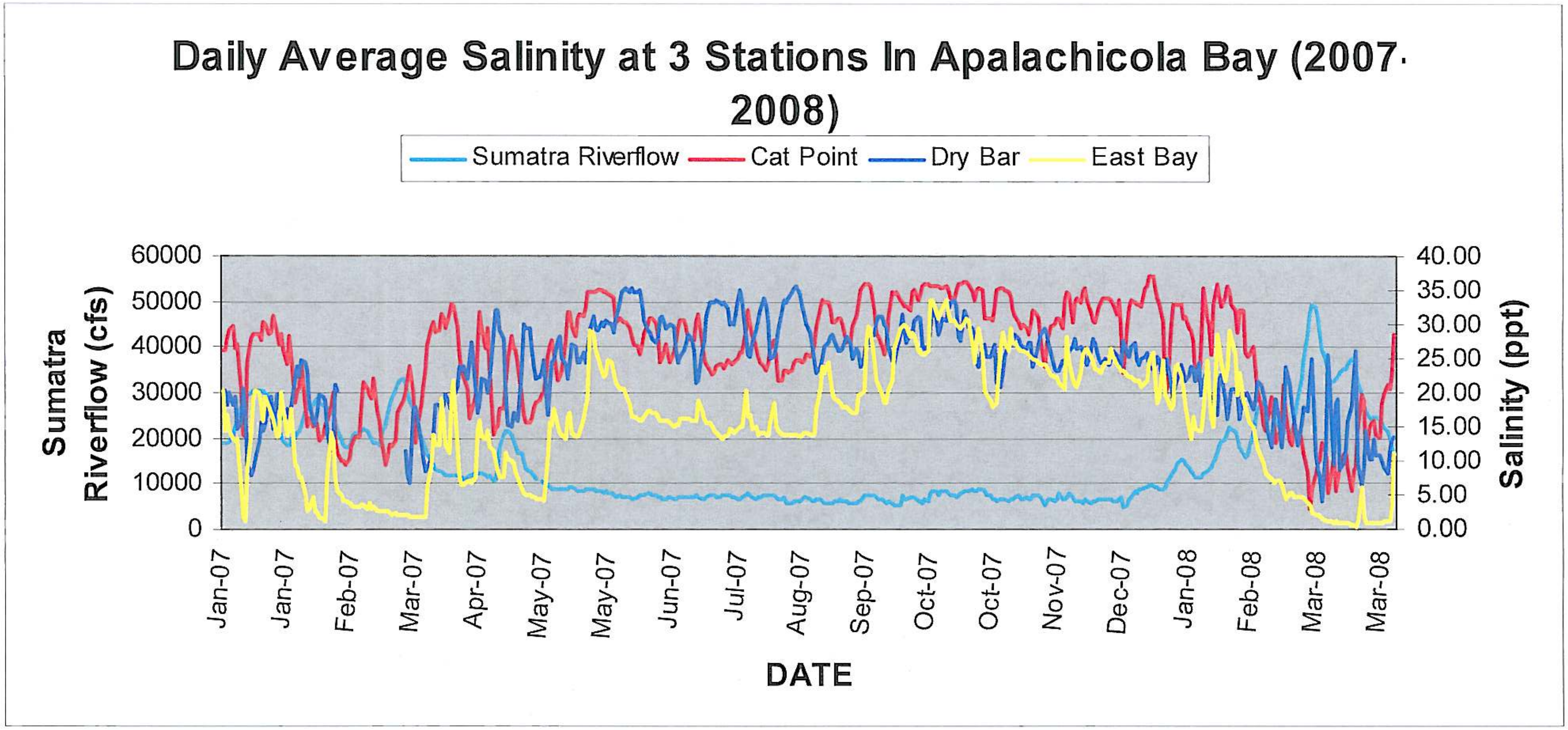

Daily Average Salinity at 3 Stations In Apalachicola Bay (2007-2008)
Sumatra Riverflow
Cat Point
Dry Bar
East Bay
Sumatra Riverflow (cfs)
60000
50000
40000
30000
20000
10000
0
Salinity (ppt)
40.00
35.00
30.00
25.00
20.00
15.00
10.00
5.00
0.00
Jan-07
Jan-07
Feb-07
Mar-07
Apr-07
May-07
May-07
Jun-07
Jul-07
Aug-07
Sep-07
Oct-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Mar-08
DATE

Exhibit D

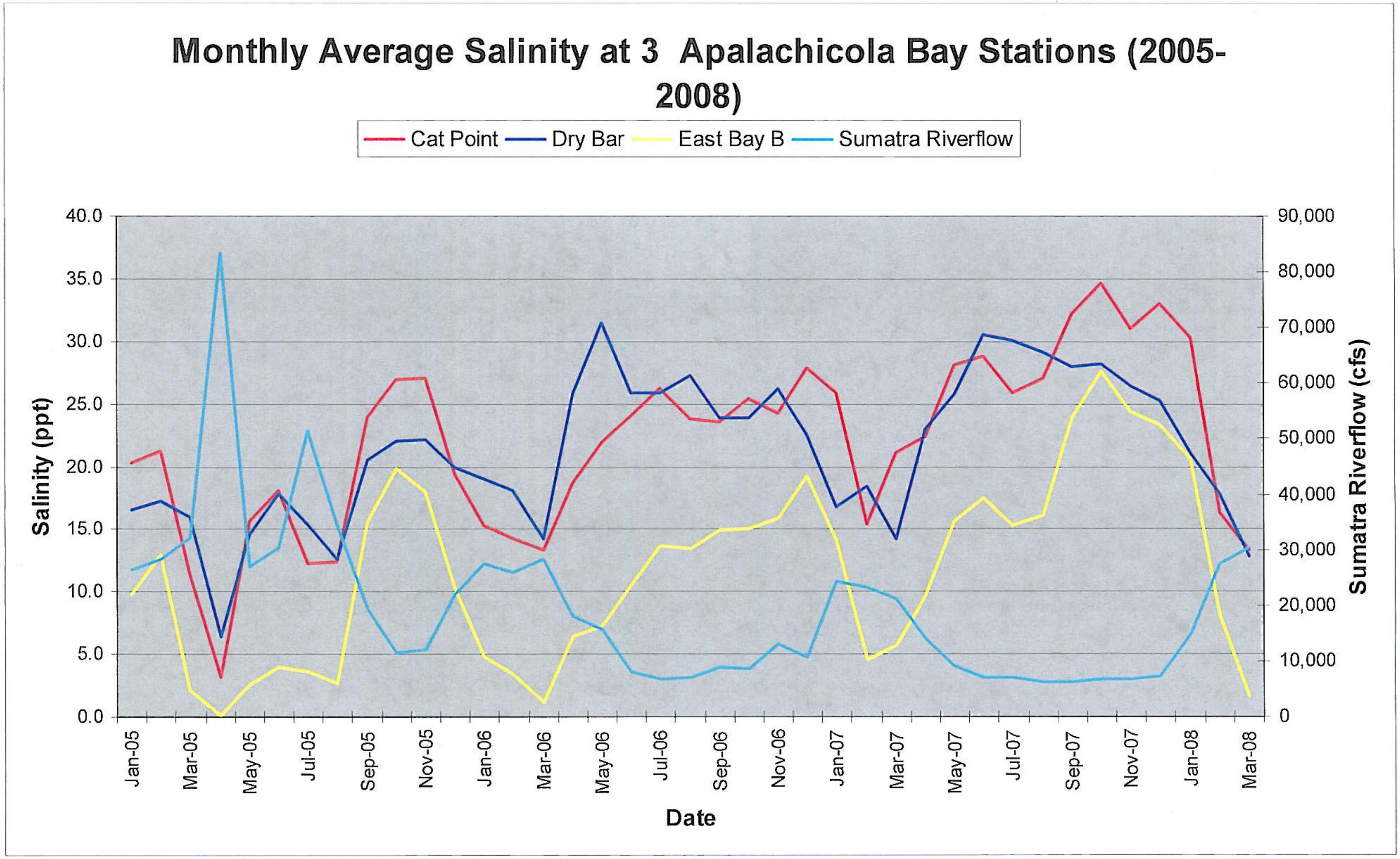

Monthly Average Salinity at 3 Apalachicola Bay Stations (2005-2008)
Cat Point
Dry Bar
East Bay B
Sumatra Riverflow
Salinity (ppt)
40.0
35.0
30.0
25.0
20.0
15.0
10.0
5.0
0.0
Sumatra Riverflow (cfs)
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Jan-05
Mar-05
May-05
Jul-05
Sep-05
Nov-05
Jan-06
Mar-06
May-06
Jul-06
Sep-06
Nov-06
Jan-07
Mar-07
May-07
Jul-07
Sep-07
Nov-07
Jan-08
Mar-08
Date

Exhibit E

LAKE LANIER ASSOCIATION, INC.

Lake Sidney Lanier
615-F Oak Street • Suite 100
Gainesville, GA 30501
LAKE LINE: (770) 503-7757

May 1, 2008

Brigadier General Joseph Schroedel
Commander and Division Engineer
U.S. Army Corps of Engineers, South Atlantic Division
60 Forsyth Street SW, Room 10M15
Atlanta, GA 30303-8801

Dear General Schroedel:

After evaluating the modified IOP proposed by the Corps on April 15, 2008, the Lake Lanier Association requests your personal assistance in examining and adjusting the document. The new IOP does not positively impact Lake Lanier and the $5.5 billion economic contribution to Georgia, the 8 million annual visitors to the Lake, the 20,000 home owners and the 2,000 businesses that derive their livelihood from the Lake. Dropping the Lake Lanier water level creates a major safety hazard for anyone that uses the Lake. Had the proposed IOP been in effect in 2007, Lanier would have been lower during the summer months than actually occurred; the lowest in its 50 year history.

We are convinced that Lanier needs specific consideration and management, rather than just inclusion with the entire ACF system. Because of Lanier's unique characteristics of significant storage (65% of ACF), and small water shed (5% of ACF), the rules for the entire system are not conducive to keeping Lanier at the highest possible level during drought conditions. We request the following provisions of the proposed IOP be re-examined with Lanier impacts considered for prudent management results:

1.) Minimum releases equal to or greater than basin inflows restrict the opportunity for reservoir refilling. The IOP should provide for greater retention of inflows.
2.) The 5000 CFS (4500 in drought zone) at the Chattahoochee gauge must be revisited for rationale and scientific justification of the flows. 2000 CFS at Chattahoochee gauge is the minimum necessary according to the Southern Company, owner of plant Scholz,
3.) The new concept of a "drought zone" seems to be a step backwards from the EDO plan currently in effect. Lanier will be disproportionately impacted and drained far too low under these provisions.
4.) The proposed IOP does not have Lanier specific triggers for storing and releasing water. Lanier can be at zone 4 while the ACF south of Buford dam is at zone 1 or normal pool. Today Lanier is 8 feet below the top of zone 4 while all other reservoirs are at normal pool.

Details supporting these comments can be found in the attached documentation.

We appreciate your commitment to do the right thing for the ACF and specifically
Lake Lanier. We are anxious to work with you and your staff to incorporate specialized management provisions to preserve maximum water levels in Lanier at all times.

Sincerely,

Jackie Joseph
President

Val Perry
Executive Vice President

cc:

Governor Sonny Perdue
U.S. Senator Johnny Isakson
U.S. Senator Saxby Chambliss
U.S. Representative John Linder
U.S. Representative Nathan Deal

State Representative Amos Amerson
Gwinnett County Commission Chairman Charles Bannister
Dawson County Commission Chairman Mike Berg
Lieutenant Governor Casey Cagle
State Representative Doug Collins
Carol Couch, PhD, Director EPD
Jonathan Davis, Project Manager, USACE
Kit Dunlap, Hall Co. Chamber
State Representative Mark Hamilton
Secretary of State Karen Handel
State Senator Lee Hawkins
State Representative John Heard
State Senator Tom Knox
Forsyth County Commission Chairman Charlie Laughinghouse
James McCoy, Cumming-Forsyth Chamber
State Representative James Mills
State Senator Jack Murphy
Hall County Commission Chairman Thomas Oliver
State Senator Chip Pearson
Bob Prince, Chief of Staff, USACE
State Representative Bobby Reese
State Representative Carl Rogers
Pat Stevens, ARC
State Senator Renee Unterman

Background paper on the CORPS of Engineers' Modified Interim Operations Plan

Prepared by the Lake Lanier Association

The Lake Lanier Association has evaluated the modifications to the Interim Operations Plan (IOP) proposed by the Corps of Engineers on Tuesday, April 15, 2008. Based on materials prepared by the Corps, it appears that Lake Lanier would have been lower by over two feet during the summer of 2007 under the modified IOP and potentially one foot higher in December of 2007 when compared to the original IOP and that system composite storage would have been lower from February through September. Actual 2007 composite storage level would have entered the modified IOP's newly-created "Drought Zone" for only a very short period of time for about two weeks in November. Since the Modified IOP is designed specifically for better system wide management during Exceptional Droughts, we believe that this is a substantial short coming of the new plan, among other issues.

While it is encouraging that the Corps has publicly acknowledged the Apalachicola-Chattahoochee-Flint (ACF) system management needs evidenced over the past year, the Lake Lanier Association believes that a number of the provisions of the modified IOP are inadvisable and ineffective for proper management of the system as a whole and of Lake Lanier in particular. Specifically, our concerns are focused on the following:

- The Composite Storage of all reservoirs and seasonal variations are used as determining factor for discharge management. Since Lake Lanier accounts for 65% of the storage yet only has 5% of the watershed, this leads to a disparity of impact on the various reservoirs. As a case in point. Lake Lanier is still in Zone 4 while the Composite Storage is in Zone 3 which means that none of the drought provisions would be triggered even though Lake Lanier is at its lowest point ever for this time of year.
- Minimum Discharges at Chattahoochee gauge can exceed the total Basin Inflow on numerous occasions, which seems unnecessary for the stated purposes.
- When the Composite Storage is in the Drought Zone, the maximum fall rate is reinstated even though it is eliminated during Zone 4 conditions.
- The Modified IOP continues to assert the need for 5,000 cfs at the Chattahoochee gauge, except for 4,500 cfs during the Drought Zone, even though there is no scientific verification of that need. Originally, 5,000 cfs was stated as a requirement for the cooling requirements of Plant Scholz. Subsequent to that the Southern Company has stated that only 2,000 cfs is required. Lake Lanier believes that 2,000 cfs should be established as the minimum discharge rate at the Chattahoochee gauge.
- Because of the disparity among the various reservoirs, we believe that Lake Lanier specific triggers should be established with the goal of maintaining as much water as possible in Lake Lanier and that Lanier should be the reservoir of last resort..

While we will engage in further analysis of the proposal, we believe it is imperative to communicate our initial observations and requests to the Corps for consideration prior to implementation of the proposed modifications.

Minimum Discharge

The modified IOP appears to require minimum releases equal to or greater than basin inflow (BI) under many conditions, and minimum releases of greater than 50% of BI under virtually all but the highest BI levels. This contrasts with the statement on page 2 that, "Except when basin inflow is less than 5,000 cfs, the minimum releases are not *required* to exceed basin inflow" (emphasis added). Requiring releases to *at least equal* BI provides no opportunity for refilling of reservoirs, and this provision applies in all but the months of December through February. Limiting storage to substantially less than 50% of BI under all but the highest BI levels seems to unnecessarily restrict the ability of the reservoirs, and especially Lake Lanier, to recover or at least stabilize in times of drought. We question the need for such high minimum releases, because they appear to create an unnecessary risk of preventing the reservoirs – and especially Lake Lanier – from refilling not only in drought conditions but even when BI is relatively plentiful. We also question allowing the highest rate of storage only when BI reaches 39,000 cfs in Zone 3, especially when the BI level for such storage in Zones 1 and 2 is 34,000 cfs. The Lake Lanier Association requests that the IOP be modified to allow storage of a much greater percentage of available BI in all Zones, in order to ensure that Lake Lanier will remain at or near the top of its conservation pool whenever possible and refill as quickly as possible. It should be noted also that the LLA has requested CORPS consideration of raising the full pool level to 1,073 feet above sea level in order to provide greater storage retention capability for the entire ACF.

The statement on page 2 also underscores the Corps' failure to reduce the minimum required flow of 5,000 cfs except under conditions in which Lake Lanier will already be well down into Zone 4. Because Lake Lanier contains the vast majority of all storage in the system, composite storage is likely to reach Zone 4 (or even the Drought Zone) only if Lake Lanier is already in Zone 4. Because Lake Lanier refills so slowly, it may well remain in Zone 4 long after the composite storage level reaches higher Zones, a condition that exists today. Lake Lanier got into this situation in part because of the requirement of a minimum flow of 5,000 cfs under the original IOP. The Exceptional Drought Operation (EDO) allowed for a reduction in the minimum required flow and the agreements by the three state Governors in Washington put forward a minimum required flow of 4,150 cfs. While the modified IOP does include the option of a minimum flow of 4,500 cfs when composite storage is in the Drought Zone, it should incorporate an even lower minimum required flow that is based on the actual requirements for realizing the original intended benefits of the system's facilities. If the system is going to be managed without specific provisions that reflect the unique needs of Lake Lanier (addressed below), then the IOP should include at least the option of implementing that minimum required flow in higher composite storage Zones. Without that flexibility, Lake Lanier will almost certainly be disproportionately impacted in drought situations (and very likely this summer, given current forecasts) in order to meet the current minimum required flow.

Drought Contingency Operations
The modified IOP creates a new Composite Storage Zone category called a Drought Zone. The Corps calculates the proposed Drought Zone as "roughly" the equivalent of water in the Inactive Zones for each of the reservoirs in the ACF system plus the water in Zone 4 of Lake Lanier. There is no explanation of why the Corps believes there is a need for the proposed Drought Zone, or what the reasoning is to use this calculation, which seems to be totally arbitrary. According to the Corps' own projections, if the modified IOP had been in place during 2007, the composite storage levels of all the reservoirs would have entered the proposed Drought Zone for only a two-week period in November, 2007. Even though the Drought Plan would have been in effect after the composite level entered Zone 4, there would have been no decrease in the minimum required flow except for that two-week period. Thus, the implementation of the proposed Drought Contingency Operations provisions would have accomplished little or nothing to prevent Lake Lanier from reaching its lowest point in history on December 26, 2007. It appears that the only reason for the existence of the Drought Zone is to relieve the Corps from having to acknowledge that an exceptional drought exists at much higher composite storage levels, and thereby from reducing flows below 5,000 cfs even in the face of the worst drought

on record in Georgia. The net goal would appear to be to keep composite storage above the Drought Zone while reducing the potential for it to rise above Zone 4. This does virtually nothing to ameliorate depleted storage conditions upstream.

Maximum Fall Rate

The EDO plan now in effect suspended the rate at which river stage (and the reservoir discharges that control river stage) could be reduced. However, the modified IOP reinstates the original down-ramping rate ("fall rate") provisions except when composite storage level falls to Zone 4 and the Drought Contingency Operation is implemented. The fall rates were a major factor in the excessive depletion of water in Lake Lanier in 2007, and reinstating them threatens to repeat the same disastrous result. Neither the Corps nor the Fish and Wildlife Service has demonstrated science justifying these fall rates. The listed mussels and Gulf Sturgeon evolved and presumably thrived prior to the creation of any of the Corps' ACF facilities. At that time, the rise and fall of the rivers were essentially uncontrolled, and the rapidity at which water levels rose and fell were far greater than the effects under either the original or modified IOP. Common sense would suggest that since the species evolved and thrived with uncontrolled fall rates, artificially restricting fall rates is not essential – and may be counterproductive – to their continued well-being. Managing outflows to control flooding is one thing, but the proposed fall rates are a separate and distinct set of controls that is not supported and should not be implemented. The modified IOP provision implementing a fall rate of 0.25/ft/day in the Drought Zone strikes us as a completely unnecessary and inadvisable step that will simply drain the reservoirs without any discernible benefit.

Lanier-Specific Triggers

The modified IOP contains no Lake Lanier-specific trigger points for storing or releasing water. It is possible for the composite storage level of all reservoirs to be in Zone 3 or even higher while Lanier is still in Zone 4 due to its much slower refill rate. As can be seen from the Corps' own charts attached to this letter, Lake Lanier is approximately eight feet below the top of Zone 4 while the composite storage level has been in Zone 3 through all of 2008. Downstream reservoirs not only naturally refill much more rapidly than Lanier, they do so even more quickly when rainfall is greater in the ACF watershed south of Buford Dam than north of it, as happened recently. This makes it not only possible but highly probable that the other ACF reservoirs will recover fully while Lanier is still as low as Zone 4. The modified IOP provides for specialized management of West Point Lake and Lake Walter F. George by allowing temporary storage above the winter pool rule curve under certain conditions. The Lake Lanier Association believes the IOP should incorporate specialized provisions for managing Lake Lanier that reflect its distinctive characteristics and management needs. Without them, Lake Lanier is destined to be disproportionately impacted by draw-downs for downstream management, without an ability to remain near full pool or to refill.

- Specifically, the Lake Lanier Association requests that the IOP be modified to include provisions that will maximize the retention of basin inflow above Buford Dam to the maximum extent possible under all conditions. The purpose of this is to allow Lake Lanier to realize the benefits intended for it under the original authorizing legislation by remaining at or near full pool whenever possible. This can best be accomplished with Lake Lanier-specific management triggers that are independent of the triggers for the entire ACF system. The Lake Lanier Association requests that the IOP be modified to incorporate Lake Lanier-specific management triggers that will maximize water storage in Lake Lanier when it falls below Zone 1 and allow the Corps to store a higher percentage of basin inflow above Buford Dam when composite storage is in Zones 2, 3, and 4. We recognize that a Lanier-specific trigger would need to be coordinated with triggers for the rest of the system, but the triggers in the modified IOP clearly fail to accommodate Lake Lanier's unique disproportion of storage volume and drainage area in comparison to the other reservoirs in the ACF. We have addressed some of the specifics of the need for specialized management in other parts of this letter, and would welcome the opportunity to address these with you directly in greater detail.

Minimum Required Flow

The modified IOP continues to use 5,000 cfs as the minimum required flow at the Chattahoochee gage. During the fall and winter of 2007, Lake Lanier's level was precipitously reduced at a rate greater than 4,000 cfs specifically to achieve this minimum flow. There is no scientific basis for the minimum flow level of 5,000 cfs. Last fall, a Corps spokesman suggested that the 5,000 cfs was initially established to accommodate Plant Scholtz, a coal-fired power plant owned by Southern Company. It should be noted that, as a non-hydroelectric plant, Scholz was not an intended beneficiary of the construction of the ACF facilities. Yet even accepting the proposition that Plant Scholz should be accommodated, Southern Company has publicly acknowledged that 2,000 cfs would suffice for that plant's water requirements. The Corps should therefore reduce the minimum required flow in the IOP to 2,000 cfs until and unless it documents greater operational flow requirements that were recognized as benefits under the original authorizing legislation for construction of the ACF facilities.

We acknowledge that the modified IOP reduces the minimum required flow at the Chattahoochee gage from 5,000 cfs to 4,500 cfs, but this applies only when the composite storage level is in the Drought Zone. Under this provision, the reduced flow rate would have occurred for only two weeks in November, 2007. At that time, Lake Lanier was already within a few feet of reaching its lowest level in history. The small reduction in flow accomplished by this provision would have lasted only two weeks and then would have ended, actually draining Lake Lanier even faster in December. The Lake Lanier Association believes that the IOP should be modified to incorporate specialized management provisions for maximizing storage in Lake Lanier, and a scientifically- and legally-supported minimum required flow at higher composite storage levels.

Lake Lanier Level under the Modified IOP

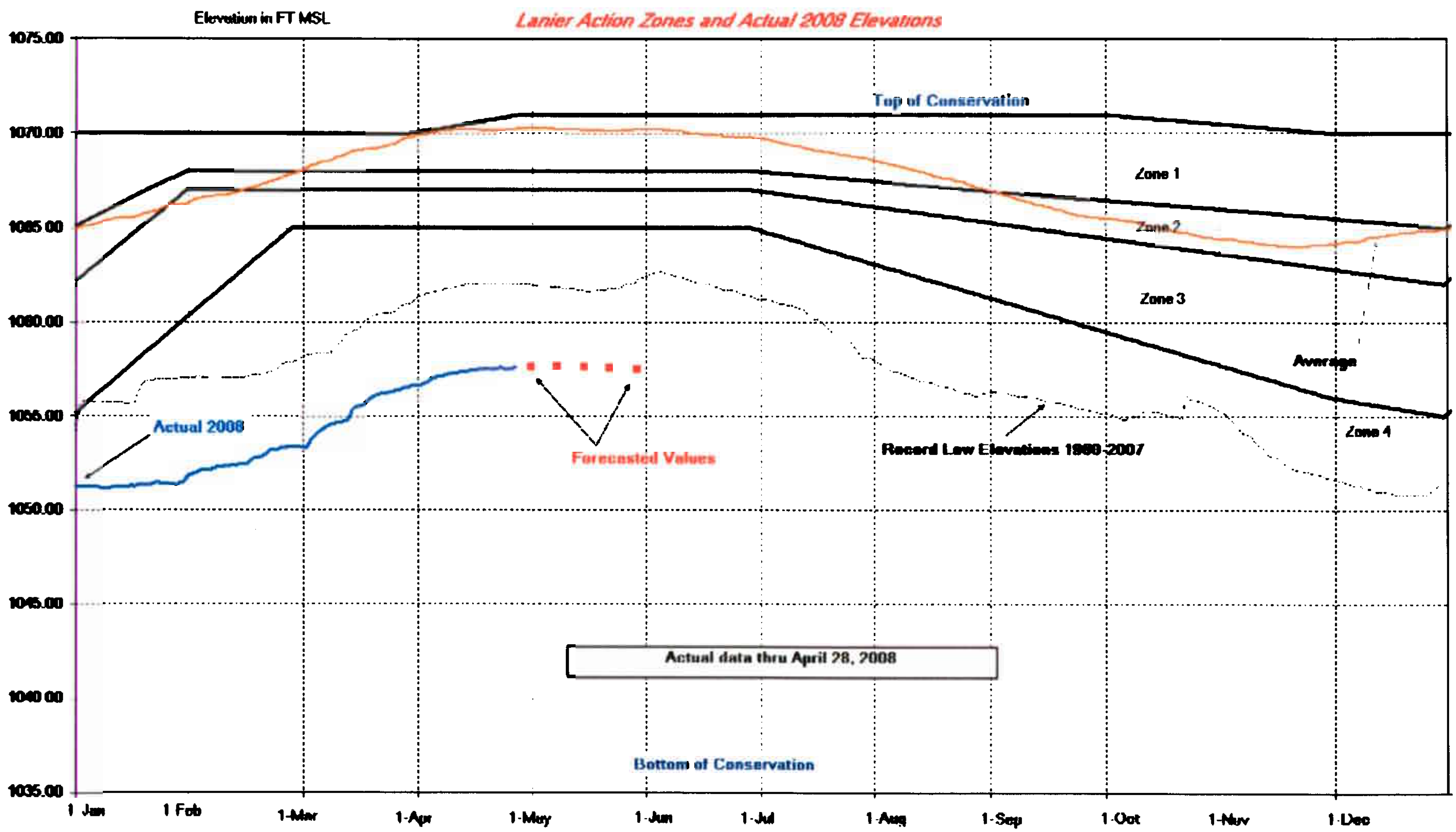
The Corps has stated that Lake Lanier would have been one foot higher under the modified IOP than it was in December, 2007 – a level that was reached largely due to the provisions of the original IOP. However, the Corps' own charts indicate that the average monthly difference would be less than six inches. As this is written, Lake Lanier is approximately eight feet below the top of Zone 4, with virtually no chance even to reach Zone 3 in the foreseeable future. Never before has Lake Lanier been this low at this time of the year, with the dry season upon us. The modified IOP not only offers no relief for this condition, it reverts to most of the inadvisable management practices of the original IOP that caused the current dire situation. Based on this, the Lake Lanier Association believes the modified IOP will be virtually as ineffective as the original IOP in properly managing Lake Lanier.

Minimum Flow at Peachtree Creek
The Georgia Environmental Protection Division recently requested, and the Corps authorized, a reduced minimum flow requirement for the Chattahoochee River at Peachtree Creek of 650 cfs, based on findings that this flow level will meet applicable water quality standards throughout the year. The Lake Lanier Association requests that the Corps incorporate this lower flow requirement in the modified IOP.

Lake Lanier Association Recommendations
The Lake Lanier Association appreciates the Corps' efforts to modify the original IOP, which dismally failed to accomplish proper management of the ACF system. But the IOP should include specialized provisions to maximize water storage in Lake Lanier. This is certainly needed whenever the composite storage level of the ACF reservoirs enters Zone 4. But minimizing outflows and maximizing water storage replenishment is also necessary when Lake Lanier's specific water level falls below even Zone 1. Lake Lanier is too vastly different from the other ACF reservoirs in its storage volume, watershed, and refill characteristics for a one-plan-fits-all strategy to be appropriate for its proper management.

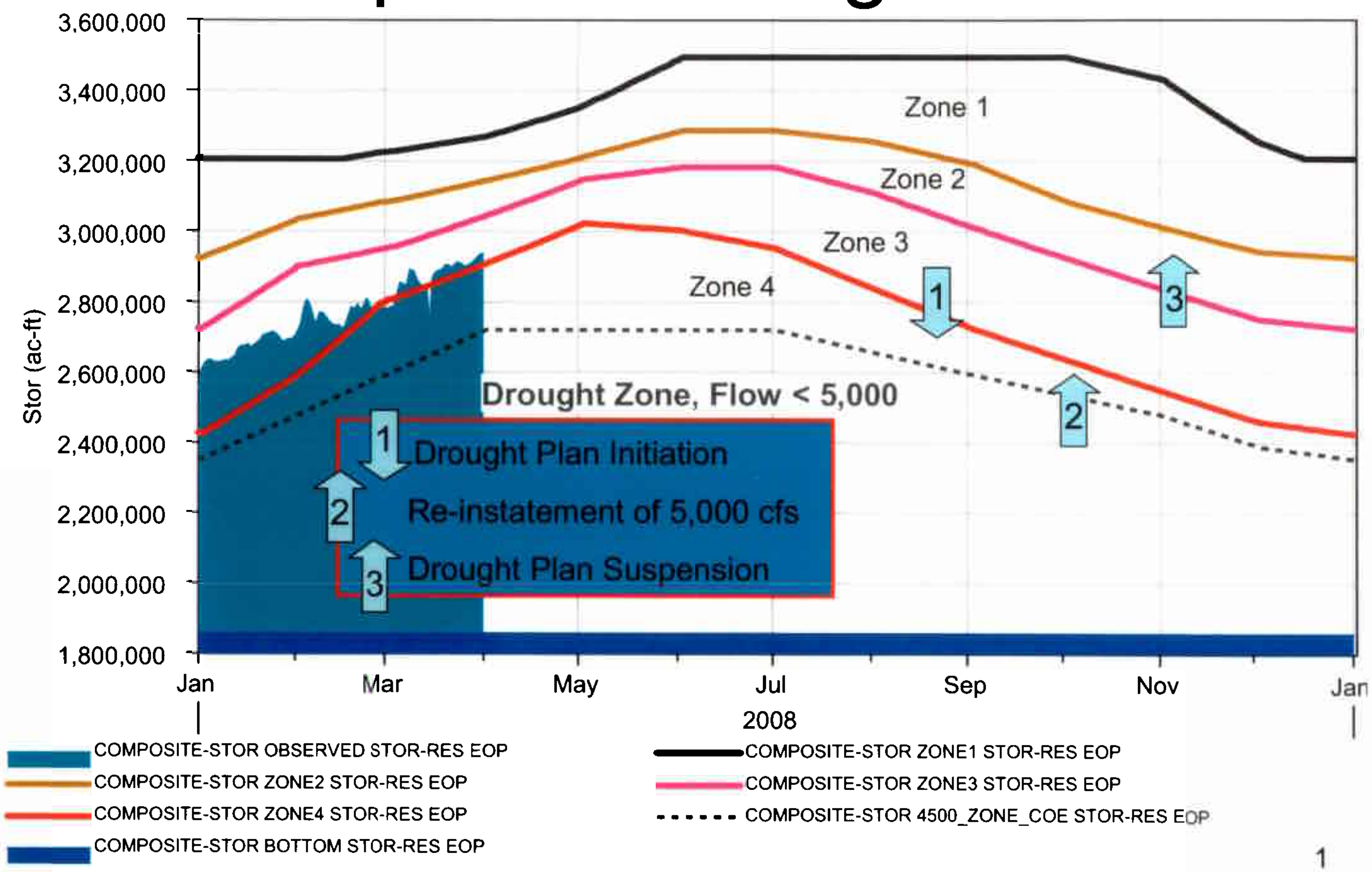
The thousands of people whose lives and livelihoods depend upon a full and clean Lake Lanier deserve proper management of this unique and valuable resource. The Lake Lanier Association strongly and urgently requests that the Corps revise the IOP to incorporate specialized management provisions to preserve the maximum level of water in Lake Lanier at all times. The drought is not over, and we would welcome the opportunity to work with you to accomplish this goal before the provisions of the modified IOP have an unnecessary and deleterious effect.

The following charts indicate the status of Lake Lanier as of this date.

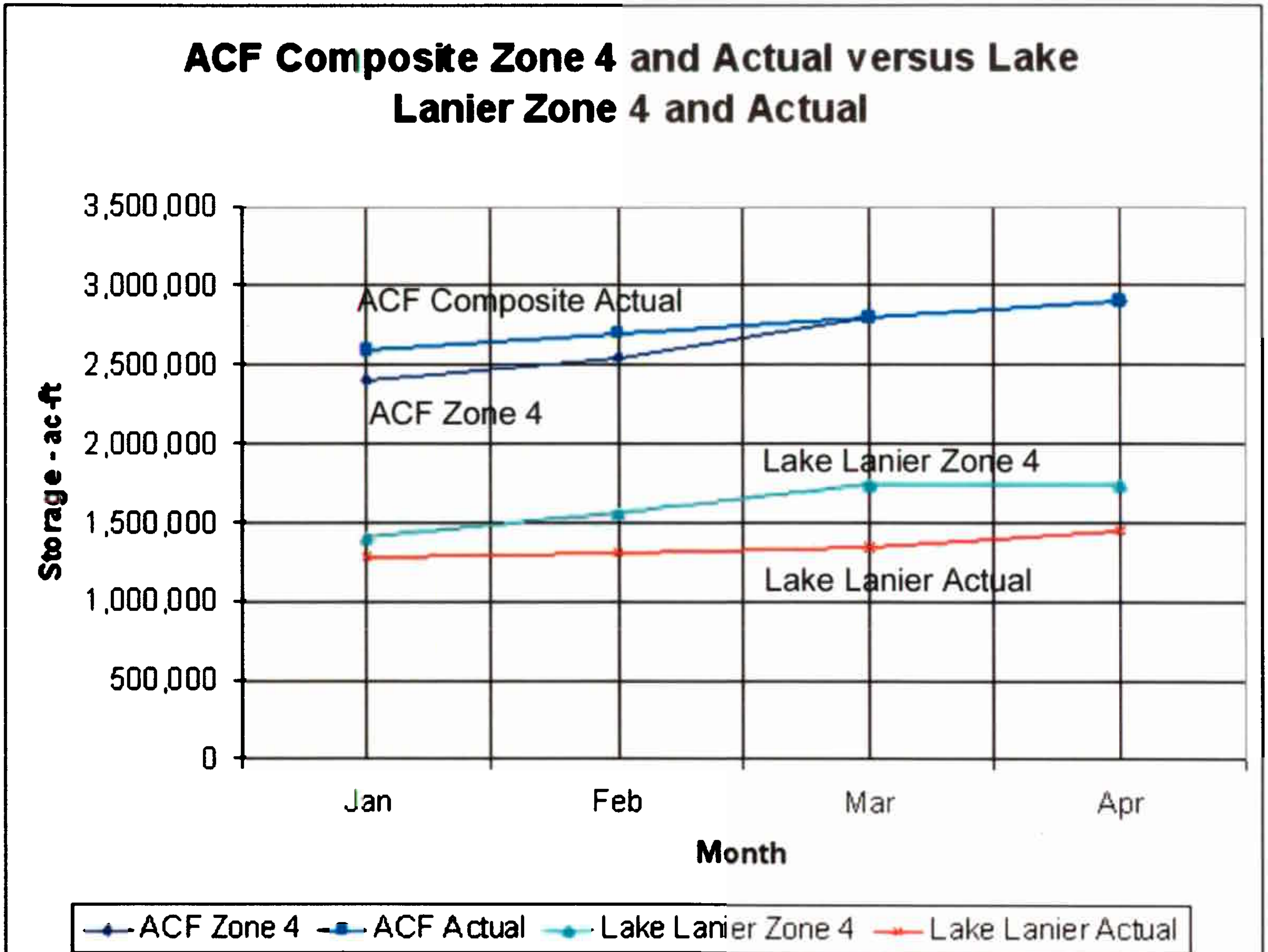


Lake Lanier is at its lowest point in history for this time of year and is projected to begin dropping even though all other reservoirs are close to full pool

Composite Storage Zones



The Composite Storage for the ACF has been in Zone 3 since the first of the year even though Lake Lanier continues in Zone 4 as shown on the next chart. It should be noted that in 2007 the Composite Storage would only have dipped into the Drought Zone for a 2 week time period in November in spite of the existence of an Exceptional Drought. Managing the ACF based on the status of the Composite Storage delays any effective action until the entire system has been substantially drained.



The CORPS data illustrates the difference between the ACF Composite and the Lake Lanier Actual levels and their relation to Zone 4 of the Composite and of Lake Lanier. This disparity results from managing the ACF system as an entity rather than focusing on the attributes of each element of the system. The other reservoirs are at the top of their respective Conservation Zones but Lake Lanier continues in Zone 4.

Congress of the United States
Washington, DC 20515

May 9, 2008

Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL 32405

Mr. Curtis M. Flakes
Chief, Planning and Environmental Division
Mobile District
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628

Dear Ms. Carmody and Mr. Flakes:

We are writing in strong opposition to the U.S. Army Corps of Engineers, Mobile District's proposed modifications to the current Interim Operations Plan (IOP) at Jim Woodruff Dam. We are deeply concerned about the impact these proposed reduced water flows will have on the health and productivity of the Apalachicola River and estuary and our Florida communities that depend on those resources for their livelihood. Additionally, the Corps' IOP fails to consider basic hydrological terms of measurement of the flows along the Apalachicola-Chattahoochee-Flint (ACF) system; the IOP violates the authorized uses of the ACF, the 1958 Water Supply Act, the recent ruling by the U.S. Court of Appeals for the District of Columbia Circuit (*Southeastern Federal Power Customers, Inc. v. Peter Geren, Secretary of the U.S. Department of the Army et al.*), and the Coastal Zone Management Act of 1972; and it does not provide for conservation of water on both the Chattahoochee and Flint Rivers or represent shared responsibility during the current drought.

First, we expect you will conduct a thorough and comprehensive review of the Corps' IOP and extend the assessment beyond June 1, 2008, to evaluate the effects that this proposal will have on the Apalachicola estuary. The Corps has indicated that this proposal, if approved by the U.S. Fish and Wildlife Service (FWS), will stay in effect until the completion of the update of the water control plans for the ACF system, a process that, in a best case scenario, will take over three years to complete. Essentially, this IOP would allow for years of dramatically reduced downstream flows to the detriment of two power plants, three endangered species, and numerous communities that depend on water released from Lake Lanier. An expedited assessment by FWS is not acceptable for a proposal that the Corps admits will likely "adversely affect the threatened Gulf sturgeon, endangered fat threeridge mussel, threatened purple bankclimber mussel and threatened Chipola slabshell and designated critical habitat for these listed species"(U.S. Army Corps of Engineers Letter Requesting Consultation to Section 7 of ESA on proposed modifications to the IOP at Jim Woodruff Dam (15 Apr 2008)).

Not only must the FWS consider the needs of the endangered species protected under the Endangered Species Act (ESA), but FWS also must examine the needs of the whole ecosystem. The FWS has a responsibility to expand the scope of its assessment to include all fish and wildlife along the ACF system, so that we can have a full picture of the impact that reduced flows will have on the entire ecosystem.

Second, the Corps, as seen in this IOP and others, has ignored basic hydrological terms of measurement when dealing with the management of the ACF. The flow regime for any water system must take into account the flow level as well as the duration of the flows and the frequency of the flows, which the Corps has failed to do. Under the Corps' IOP, the drastically low flow levels, below even historical low flow levels for the ACF system, are proposed for twenty-four hours a day, seven days a week, for extended periods. Absent any relief, the IOP will prevent the species downstream from being able to recover from these historically low levels.

Third, the method in which the Corps calculates "inflow" illustrates the flaws with the Corps' measurement of flows and puts those downstream at a distinct disadvantage. The calculation of "inflow" shows no recognition of the withdrawals or evaporation from the lakes, even though they can often be a significant percentage or exceed the total actual inflow. The significance of the Corps' inflow calculation is further realized when the triggers outlined by the IOP for reducing flows to the Apalachicola River are based on the inflows reaching a lower amount. In other words, under the IOP, the more water the greater Atlanta area withdraws from Lake Lanier, the calculated inflow is reduced, which then triggers lower releases downstream. This methodology encourages upstream water use that will help maintain lake levels for water supply and increases and extends low flows to downstream users.

Fourth, not only is the Corps' IOP wholly inconsistent with the Corps' repeated assertion that it is not in the water supply business, it is also in direct defiance of current federal laws. The implementation of the Corps' IOP, allowing for drastically reduced flows downstream and unlimited storage capacity upstream, would make Lake Lanier a reservoir that is being used primarily to store water for consumption by the city of Atlanta. This is in clear violation of the congressionally-authorized purposes of the ACF (in accordance with the Rivers and Harbors Act of 1945 and the River and Harbors Act of 1946), the 1958 Water Supply Act, and the recent ruling by the U.S. Court of Appeals for the District of Columbia Circuit (*Southeastern Federal Power Customers, Inc. v. Peter Geren, Secretary of the U.S. Department of the Army et al.*). The Corps' IOP also violates the federal consistency requirements as outlined by the Coastal Zone Management Act (CZMA) of 1972. In 1981, the state of Florida's Coastal Management Program (FCMP) was approved by the National Oceanic and Atmospheric Administration (NOAA). Therefore, under the CZMA, the state of Florida is authorized to review federal activities affecting the land, water use, or natural resource of the coastal zone for consistency with the federally-approved FCMP.

Lastly, the Corps' IOP does not represent shared responsibility during the current drought, nor does it protect all users along the ACF basin, specifically downstream users. The triggers outlined in the IOP only impose reduced downstream flows and do not provide for conservation of water on both the Chattahoochee and Flint Rivers. In order for the IOP to be truly equitable, responsible, and comprehensive, these triggers must also force some sort of demand management requirement on upstream users.

In recent months, under the Corps' Extraordinary Drought Operations (EDO) currently in place, the Apalachicola River and the Apalachicola Bay have suffered considerably, while water use in Georgia remains practically unrestricted and the Flint River water consumption continues unabated. The state of Florida should not have to bear the full brunt of this problem, as the Corps' IOP suggests.

The FWS has the authority to impose a reasonable and prudent alternative to the Corps' revised IOP that addresses the concerns brought forth in this letter and that Florida's stakeholders have repeatedly expressed to your agencies. Thank you for your consideration of these requests, and we appreciate a prompt reply.

Sincerely,

U.S. Senator Bill Nelson

U.S. Representative Allen Boyd

U.S. Senator Mel Martinez

U.S. Representative Ander Crenshaw

U.S. Representative Jeff Miller

cc: Hon. Dirk Kempthorne, Secretary, U.S. Department of Interior
Lt. Gen. Robert L. Van Antwerp, Commander, U.S. Army Corps of Engineers
Col. Byron Jorns, District Commander, U.S. Army Corps of Engineers
Mr. Dale Hall, Director, U.S. Fish and Wildlife Service
Mr. Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service
Brig. General Joe Schroedel, U.S. Army Corps of Engineers

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ALABAMA POWER
A SOUTHERN COMPANY

May 13, 2008

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Supervisor, Ecological Services
U.S. Fish and Wildlife Service
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Mr. Curtis M. Flakes
Chief, Planning and Environmental
Division
Mobile District
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P.O. Box 2288
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RE: Proposed Modification to Interim Operations Plan for ACF Reservoir Basin

Dear Ms. Carmody and Mr. Flakes:

Alabama Power Company has reviewed the U.S. Army Corps of Engineers' April 15, 2008, letter to the U.S. Fish and Wildlife Service ("FWS") requesting the initiation of formal Section 7 consultation on the Corps' proposed modifications to the current Interim Operations Plan ("IOP") at Jim Woodruff Dam. Alabama Power also has reviewed the separate description of the proposed action available on the website of the Corps' Mobile District Office. As a stakeholder in the Apalachicola-Chattahoochee-Flint ("ACF") River Basin, Alabama Power requests that the Corps and the FWS consider the following comments as the two agencies develop a revised IOP for the ACF River Basin projects.

As more fully set forth below, Alabama Power is very concerned that the proposed modified IOP does not expressly provide for the flows and reservoir elevations needed for the Farley Nuclear Plant's safe and reliable operation. Alabama Power is also very concerned that the IOP, and the proposed modified IOP, assume there will be no operations for navigation in the ACF River Basin. The historic operations of the ACF projects for both hydropower and navigation have generally provided adequate elevations and flows at Plant Farley for its operations, and, when necessary, for barge transportation to and from the plant. Allowing the ACF reservoirs to fill in the spring is crucial to providing adequate flows year round for navigation and other purposes. Actual operations under the current IOP have demonstrated that the IOP, as previously modified from time to time, has not provided adequate opportunities to store water during the spring. While the proposed modified IOP ostensibly seeks to provide for more opportunities to fill the upstream reservoirs, in some circumstances the proposed modified IOP could make it even more difficult to fill the upstream reservoirs than under the current IOP.

Lastly, Alabama Power believes the Corps and FWS have not adequately assessed the flow needs of the Gulf sturgeon and the Apalachicola mussels, and have overestimated the flows these species need for survival. In some instances, the high spring flows mandated under both the current IOP, and under the proposed modified IOP, may actually be detrimental to these species.

I. Alabama Power's Interests in the ACF River Basin

Alabama Power is the owner of the Farley Nuclear Plant, which is located on the Chattahoochee River near Dothan, Alabama, below George W. Andrews Lock and Dam. Plant Farley is operated by Southern Nuclear Operating Company. Plant Farley, which provides 19% of Alabama Power's total electricity generation, relies on adequate elevations and flows in the river for cooling water and discharge assimilation. From time to time, Alabama Power also requires adequate flows and navigation maintenance activities by the Corps in the Chattahoochee and Apalachicola Rivers to transport oversized equipment to and from Plant Farley by barge. Accordingly, Alabama Power has significant interests in the flows of the ACF River Basin at Plant Farley and the storage in the Corps' upstream reservoirs which support those flows.

As more fully explained in the attached October 30, 2007, letter from the Southern Company to the U.S. Department of Energy (Attachment A), Plant Farley has two nuclear fueled units, which provide a combined 1,776 megawatts of baseload generation, which are critical to maintaining regional transmission reliability for the Southern Company's system. Shutdown of either of Plant Farley's units due to unacceptably low elevations or flows in the Chattahoochee River below Andrews Dam would have a significant impact on the electricity supply to the citizens in the Southeast, including those throughout the ACF River Basin. The reliability of the Southern Company's transmission system during off-peak periods (October–May), when critical maintenance is being performed on generation and transmission assets, cannot be maintained without Plant Farley's generation.

Southern Nuclear defines a flow of 2,000 cfs and river elevation of 74.5 feet mean sea level ("ft MSL") as the minimum conditions necessary for long-term operation at Plant Farley. While Plant Farley can physically operate for very short periods (a few days) below 2,000 cfs flow, extended operation below this flow level would require detailed evaluation to determine the potential environmental and operational impacts.[1] Generally, Plant Farley operates with a river elevation between 76 and 78 ft MSL. Operation below 74.5 ft MSL also would require detailed evaluation to determine the potential environmental and operational impacts. Plant Farley's discharge is limited by a National Pollutant Discharge Elimination System ("NPDES") Permit issued by the Alabama Department of Environmental Management ("ADEM"). That permit contains limits and requirements to ensure the thermal discharge and chemical

[1] Other industries, including Mead Westvaco and Georgia Pacific, also rely on these same flows to meet their applicable water quality standards.

constituents in the effluent meet applicable water quality standards. At 2,000 cfs flowing past Plant Farley (*i.e.*, going through Andrews Lock and Dam), there are no significant adverse thermal or chemical impacts resulting from Plant Farley's discharge. When flows are reduced below 2,000 cfs an evaluation of the impacts of that discharge is required by Southern Nuclear, state environmental agencies, and, potentially, the Nuclear Regulatory Commission ("NRC"). Plant Farley also discharges small quantities of radwaste through the discharge line in strict compliance with NRC's regulations. Consequently, lowering river flows would prompt NRC review of Plant Farley's operating license provisions to confirm the acceptability of continued operations.

Plant Farley is also operated pursuant to operating licenses issued by the NRC. These licenses were obtained based on extensive environmental and safety analyses in conjunction with the NRC and its predecessor, the United States Atomic Energy Commission. Alabama Power relied on the historic flows in the ACF River Basin and the lawful operation of the Corps' ACF reservoirs, as well as information and review by the Corps, in its licensing process.

For example, prior to construction of Plant Farley, the Atomic Energy Commission ("AEC") published its June 1972 Environmental Statement (Attachment B). The AEC noted specifically Alabama Power's reliance on the Corps' obligation to maintain a nine foot deep navigation channel in the Chattahoochee River, which corresponds to a river elevation of 76 ft MSL at the plant site. The AEC's Final Environmental Statement provides as follows:

> The headwaters of [Lake Seminole] back up to the Chattahoochee as far as the Columbia Lock and Dam, so that the river at the Farley station site is actually the headwaters of Lake Seminole rather than a normal river. . . .
>
> At present the regime of the river is much changed by the completion of Columbia Dam and Walter F. George Dam in 1964. It is the controlled discharge of these dams that controls the low stage flow of the river, and also the discharge of the Jim Woodruff Dam and the stage of Lake Seminole. The level of Lake Seminole, and hence the level of the river at the station site, is held no lower than 76 ft msl to provide a minimum depth of 9 feet in the navigation channel. . . .the river stage must be maintained at 76 feet msl, and this will provide ample water for the station. A more complex problem is the minimum flow that should be used in determining the dilution of discharges from the station. An examination of the record suggests that a flow of 2,000 cfs (900,000 gpm) will be exceeded 90% - 95% of the time.

Final Environmental Statement Related to Construction of Joseph M. Farley Nuclear Plant Units 1 & 2, Alabama Power Company, II - 20 (June 1972).

Likewise, Section 2.3.1 of the Final Environmental Impact Statement Related to the Operation of Plant Farley provides:

> The Corps of Engineers retains controls over the operation and maintenance of the entire Chattahoochee – Flint – Apalachicola River system. Continuous surveillance is maintained over Lake Seminole, the portion of the Chattahoochee River which is most directly affected by the Farley Plant, as well as over other reservoirs upstream and downstream. The staff has made extensive use of the Corps' recent Environmental Impact Statement for this river system in assessing the current use of Lake Seminole. . . . A 100 foot wide channel is maintained at a depth of 9 feet by dredging; . . .

Final Environmental Statement Related to Operation of Joseph M. Farley Nuclear Plant Units 1 & 2, Alabama Power Company, 2-6 (Attachment C). These Environmental Statements were reviewed by the Corps, and at no time did the Corps ever suggest that these historic flow and navigation conditions would not be met.

In addition to depending on these historic flows and elevations, as well as the Corps review and input necessary to the engineering, design and safety of the plant, the proximity of Plant Farley to a federally authorized and maintained navigable river was a primary factor considered in its siting. Most of the large equipment for the original plant construction was delivered by barge, and in both 2000 and January 2006 vital replacement and maintenance activities were performed requiring barge transport to and from the plant. This is particularly important because rail transportation to Farley is not adequate for these purposes. Additionally, abandonment of navigation would also increase costs and would limit the potential for expanding Plant Farley in the future.

II. Problems with the Interim Operations Plan ("IOP")

A. Plant Farley's Flow and Elevation Needs

Plant Farley's needs were considered over a number of months, along with other industry flow needs, as part of the interstate compact negotiations concerning a proposed Allocation Formula for the ACF River Basin. These flows were validated through significant investigation and evaluation and ultimately were agreed to in a Memorandum of Understanding ("MOU") entered into by the States of Alabama, Florida, and Georgia in 2003 as part of the ACF Compact negotiations. (Attachment D). The MOU specifically recognized the need for the Corps to provide a minimum daily flow of 2,000 cfs below George W. Andrews Lock and Dam just above Plant Farley. The recent November 15, 2007, Environmental Assessment for the Corps' Exceptional Drought Operation Plan ("EDO") recognizes Plant Farley's intake elevation and flow requirements and explains that the Corps incorporated these requirements into the EDO.[2]

[2] U.S. Army Corps of Engineers, Mobile District, Environmental Assessment, Temporary Exceptional Drought Operations Modifications to the Interim Operating Plan at 43 (Nov. 15, 2007). The Corps' consideration of Plant Farley's flow needs is also recognized in the Corps' "ACF River Basin – The Facts and Status" report on the Mobile District's Homepage, available at http://www.sam.usace.army.mil/webdoc/ACFDrought2007.pdf (created Oct. 21, 2007).]

In addition, existing Corps ACF manuals recognize Plant Farley's flow and elevation needs. The Corps' Walter F. George Reservoir Regulation Manual specifically recognizes that Plant Farley and other industries require adequate flows and elevations for their operations and downstream water quality:

> Among the industrial users are two paper company facilities and one nuclear power plant. Mead Paper Company, at the headwaters of W.F. George Lake, and the Georgia Pacific Corporation, in the headwaters of Lake Seminole, withdraw water for processes used in the manufacturing of wood products. These companies must also meet special water quality requirements for discharge that are based on a combination of dissolved oxygen and flow in the river. The Alabama Power Company's Farley Nuclear Power Plant is located on the Chattahoochee River downstream from Columbia, Alabama. The plant has an intake structure that provides cooling water for its nuclear fuel, and is dependent upon a river-state above 76 feet MSL for safe operation.

Apalachicola River Basin Reservoir Regulation Manual, Appendix C, Walter F. George Dam at C-13 (Feb. 1993).

Surprisingly, the proposed modified IOP wholly ignores the middle/lower Chattahoochee River needs and the agreed upon and required minimum flows at Columbus, Georgia [1,350 cfs daily/1,850 cfs weekly] and Columbia, Alabama [2,000 cfs daily]. By focusing solely on the required minimum flow at the downstream Woodruff dam, and given the uncontrolled inflow from the Flint River into Lake Seminole, it is likely that the stretch of the Chattahoochee River between Columbus and Columbia will be deprived of the minimum flows necessary for water quality and important municipal and industrial operations, including Plant Farley, all to the detriment of the public.

As of April 24, 2008, the ACF River Basin is in composite zone 4. Under the proposed modified IOP, the only required minimum flow would be 5,000 cfs at Woodruff. This flow could be provided solely from the Flint River's inflows, as opposed to sufficient releases from West Point and George reservoirs to provide the required minimum flows at Columbus and Columbia. During December 2007, the average daily discharge from George reservoir was 1,225 cfs [2,823 max/0 min], less than the 2,000 cfs required at Columbia, yet the average daily discharge from Woodruff Dam for the same period was 5,512 cfs [9,781 max/4,296 min], according to information from the Corps' ACF River Basin web site. According to USGS data, during December 2007, the average daily flow at Columbia was only 2,084.07 cfs, with daily low flows of 696 and 729 cfs. Similarly, during April 2008, average inflows to Lake Seminole were 70% of the historic average for the month—much higher than the average inflows to the upstream projects, 46% at Lanier, 43% at West Point, and 56% at George. This indicates high inflows to Woodruff from the Flint River.

Accordingly, Alabama Power requests the Corps to specify in the proposed modified IOP that the Corps' ACF projects will be operated to protect Plant Farley's elevation and flow needs as outlined in Section II above.

B. No Navigation Support

One of the principal purposes of the ACF River Basin reservoir system, as originally authorized by Congress, is navigation. Each of the federal projects located in the ACF has a critical role to play in maintaining navigation in the ACF River Basin. For example, the current reservoir regulation manual for Jim Woodruff Reservoir describes Woodruff as "a multi-purpose project created primarily to aid navigation in the Apalachicola River below the dam and in the Chattahoochee and Flint Rivers above the dam and to generate electric power." Apalachicola River Basin Reservoir Regulation Manual, Appendix A, Jim Woodruff Reservoir at A-10 (Rev. July 1985). To this end, the Corps is directed to maintain Woodruff at an elevation of approximately 77 ft MSL while continuously releasing inflows to the Apalachicola River in order to support a nine foot deep navigation channel. *Id.* at A-16, A-17. Continuous navigation operations are to be curtailed only during unusual low-flow events, consistent with static head limitations. *Id.* at A-18.

Upstream, the George W. Andrews Reservoir is described in its Reservoir Regulation Manual as "a single purpose project designed to aid navigation by providing a 9-foot navigation channel and by maintaining a more uniform downstream flow." Apalachicola River Basin Reservoir Regulation Manual, Appendix D, George W. Andrews Reservoir at D-5 (Rev. Feb. 1978). Because Andrews, like Woodruff, is a run-of-river project, Andrews aids navigation primarily by passing inflows released from upstream projects. All efforts are to be made to ensure Andrew's tailwater does not drop below elevation 77 ft MSL—the minimum elevation needed to maintain a nine foot navigation channel. *See id.* at D-26. When Andrews can no longer support this tailwater elevation, "arrangements may have to be made for limited operation of the Walter F. George power plant, or for equivalent spillway discharges." *Id.* Indeed, all three of the upstream reservoirs—W.F. George, West Point, and Lanier—are required to support navigation from Columbus, Georgia, to the Gulf of Mexico. As the Corps' 1989 Draft Water Control Plan recognizes, "all three of the major storage projects will be utilized to provide the designated level of support" for navigation "for as long as possible and, of course, preferably year-round." ACF Basin Water Control Plan at 17-18 (Draft Oct. 1989).

As explained above, Plant Farley was specifically designed and built on the assumption that the Corps would operate the ACF reservoirs to ensure a minimum elevation of 76 feet above MSL between Andrews and Woodruff, where Plant Farley is located, for as much of the year as possible. When the ACF reservoirs are operated to meet the elevation and flow targets specified in the Woodruff and Andrews Reservoir Regulation Manuals, Plant Farley's operational requirements are met. Nevertheless, the IOP, and the proposed modifications to the IOP, assume that there will be no operations for navigation. The exclusion of operations for navigation under the IOP is in blatant violation of the original Congressional authorization of the ACF reservoir system and the Corps' own ACF reservoir regulation manuals.

The IOP is almost exclusively driven by fish and wildlife concerns. However, only one ACF reservoir—West Point—was expressly authorized by Congress for fish & wildlife purposes. Additional flows for fish and wildlife are appropriate only after the primary purposes of the ACF reservoir system, including navigation, have been met.[3] Moreover, the entire process undertaken by the Corps and FWS is backwards. The Corps has no independent authority to create an "Interim Operating Plan" designed to benefit threatened and endangered species to the detriment of the authorized purposes of the ACF reservoir system. Under the applicable provisions of the Endangered Species Act and the FWS' implementing regulations, the discretionary elements of the Corps' 1989 Draft Water Control Plan—and the existing, authorized, reservoir regulation manuals for the specific ACF projects—should have been the subject of ESA Section 7 consultation. However, there has never been any actual determination whether the Corps' pre-IOP operations potentially "jeopardize[d] the continued existence" of the Gulf sturgeon or the Apalachicola mussels or "destroy[ed] or adversely modif[ied]" those species' critical habitats, as those terms are defined under the ESA. By making the IOP the subject of Section 7 consultation, the Corps and FWS have put the cart before the horse and have acted inconsistently with Section 7 and the authorized purposes of the ACF reservoirs.

The Corps has concluded that operation and maintenance activities to provide for navigation have been properly excluded from the IOP because the Corps has been unable to conduct navigation maintenance activities since 2000, due in large part to the State of Florida's denial of a Clean Water Act Section 401 permit to the Corps. However, the Corps has the authority under Clean Water Act Section 404(t) and Section 511(a) to proceed with navigation maintenance despite Florida's denial of a Section 401 permit. Additionally, Florida's Coastal Management Program, enacted pursuant to the federal Coastal Zone Management Act ("CZMA"), does not provide an independent basis for Florida to block navigation maintenance on the Apalachicola River. Under Section 307(e) of the CZMA, the CZMA's consistency review program may not be construed as diminishing, superseding, or modifying existing federal responsibilities over navigable waters. The lack of Florida's approval of navigation maintenance, therefore, does not provide a legitimate basis for the Corps' apparent abandonment of navigation under the IOP.

C. *Inadequate Conservation of High Flow Events*

Alabama Power is very concerned that the IOP, and the proposed modifications to the IOP, greatly undermine the ability of the Corps to meet minimum elevation and flow requirements for as much of the year as would otherwise be possible. It is particularly important

[3] *See In re Operation of the Missouri River System Litigation*, 421 F.3d 618, 631 n.9 (8th Cir. 2005) (if "ESA compliance would force the Corps to abandon the dominant [Flood Control Act] purposes of flood control or downstream navigation, *the ESA would not apply*") (emphasis added). The Supreme Court has recently held that ESA Section 7 consultation only applies to *discretionary* federal action. *Nat'l Ass'n of Home Builders v. Defenders of Wildlife*, 127 S. Ct. 2518, 2536 (2007). The Corps has no discretion to abandon navigation support, one of the dominant purposes of the ACF reservoir system. *See In re Operation of the Missouri River System Litigation*, 421 F.3d at 629 n.7 ("[I]f faced in the future with the unhappy choice of abandoning flood control or navigation on the one hand or recreation, fish and wildlife on the other, the priorities established by the [Flood Control Act] would forbid the abandonment of flood control or navigation.").

to fill the upstream reservoirs during the winter and spring, to the maximum extent consistent with downstream needs, so that water is conserved to provide reasonable and adequate downstream flows during the rest of the year. This is particularly important during the hot and dry summer months when temperature becomes a greater concern for downstream industries like Plant Farley, which must meet Clean Water Act thermal discharge limits and other water quality requirements.

Alabama Power asked Mr. Randy Kerr, a licensed professional engineer who served as Manager of Tennessee Valley Authority River Forecasting for over ten years, to review and critique both the Corps' IOP and the proposed modifications to the IOP. As described in his report (Attachment E), the IOP provides for unnecessarily high releases during the March to May time period when a larger portion of the inflows into the ACF River Basin should be retained in the upstream storage reservoirs to help meet other project purposes and objectives later in the year, including navigation and hydropower generation. In low-flow years, this problem is magnified despite the lower minimum flow requirements of the proposed modifications to the IOP.

As further explained by Mr. Kerr, the proposed modifications to the IOP do not improve, and in some cases exacerbate, these operational problems. The current IOP calls for releasing all basin inflows below 18,000 cfs between the months of March to May, while the proposed modified plan sets the threshold at 16,000 cfs. The current IOP keeps the release at 18,000 cfs until the basin inflow is 25,714 cfs. However, under the modified IOP, if the basin inflow is 25,714 cfs the release from Jim Woodruff Dam is required to be 16,000 cfs plus 50 percent of the basin inflow above 16,000 cfs (as long as the composite storage is in Zones 1 or 2). This results in a required release of 20,857 cfs, or 2,857 cfs *more* than is required under the current IOP. Examining inflow data for March to May in 2004, for example, the current IOP would have allowed 60,102 dsf of water to be stored in the upstream projects. Under the modified IOP, only 43,690 dsf of water could have been stored over the same period.

For the months of December, January, and February, the proposed modifications to the IOP appear to allow more water to be stored in the ACF River Basin than under the current IOP. However, limited storage capacity downstream of Buford Dam restricts the amount of water which actually can be stored during this season. As illustrated this past winter when the required minimum releases were only 5,000 cfs, the releases at Jim Woodruff Dam remained at approximately 5,000 cfs only until December 19, 2007. Once inflows increased in the ACF River Basin and the two lower storage projects, (West Point and W.F. George) were essentially full, releases at Jim Woodruff Dam had to be increased to maintain the reservoir's flood storage capacity. Thus, even with the ACF River Basin operating under the EDO, releases at Jim Woodruff Dam averaged over 13,000 cfs and 25,000 cfs for the months of January and February of 2008, respectively.

One recommended change identified by Mr. Kerr would be to require the daily average release to be at least 1,000 cfs less (for basin inflows of 16,000 cfs or less) than the basin inflow until the 5,000 cfs threshold is met. This would still allow some storage of water in the ACF River Basin while mimicking natural flows in the basin. Also, any modified drought plan should address revisions to the operations at West Point and W.F. George to allow overfilling to ensure adequate water storage to support low flows during the summer. As explained in Mr. Kerr's reports, under the EDO and the proposed modifications to the IOP, composite storage for the basin is largely determined by storage in Lake Lanier. Walter F. George and West Point reservoirs could both be in Zone 4, Lanier could be in Zone 1, and high flows could still be mandated under the EDO and the proposed modifications to the IOP. Therefore, the Corps should re-evaluate the Zone 4 elevations for the Corps' Walter F. George and West Point reservoirs, particularly during the August to December time period. Raising the Zone 4 elevations would allow these projects to help augment the flows required at Jim Woodruff Dam during extreme drought conditions.

D. Inadequate Biological Assessment of Impacts to the Gulf Sturgeon and Apalachicola Mussels

The high flow regime mandated by the IOP is not necessary to comply with the Endangered Species Act or to otherwise benefit threatened and endangered species located in the Apalachicola River. Alabama Power asked two well-qualified biologists to independently review the scientific conclusions of the FWS set forth in the September 5, 2006, Biological Opinion (as corrected on September 22, 2006) and the November 15, 2007, Amended Biological Opinion. These reports indicate that the Corps and the FWS have erred in key respects in evaluating the flow requirements for the threatened and endangered species at issue.

As discussed in the October 16, 2007, report on the Gulf sturgeon prepared by ichthyologist Dr. Mike Howell, Ph.D., (Attachment F), the Biological Opinion identifies no basis for concluding that the Corps' historic operations of the ACF reservoirs have had any negative effect on the Gulf sturgeon, either during the sturgeon's spawning months of March-May or at any other time of the year. There is no data in the Biological Opinion, Amended Biological Opinion, or in any of the cited published studies, indicating any negative effect of the Corps of Engineers' IOP (or any pre-IOP discharges) on the Gulf sturgeon either during the sturgeon's spawning months or at any other time of the year. In fact, the findings of a population study done by two university professors from Florida (at the request of FWS) stated, "Currently, the Apalachicola River population of Gulf sturgeon appears to be slowly increasing over levels observed in the 1980's and 1990's." Pine and Allen, 2005, p. 4955-4956. Thus, the historical (pre-IOP) water discharges have not been shown to decrease the Gulf sturgeon population since the 1980's and early 1990's, because the population numbers have actually increased during this period. In other words, there is no scientific justification for the increased spring flows mandated by the IOP. Additionally, Dr. Howell determined that the record shows that the high spring flows required by the IOP are not necessary for successful Gulf sturgeon spawning. The study by Pine et al. (2006) found successful spawning at flows of 12,700-22,400 cfs. The Amended Biological Opinion itself recognizes little impact to sturgeon spawning acreage under the low-flow scenarios examined in formulating the EDO.

Moreover, flows of 20,400 cfs or higher would likely be detrimental to sturgeon eggs by preventing their attachment to the limestone shelf substratum. Additionally, it is Dr. Howell's professional opinion that the additional nutrients added by floodplain inundation have little to do with the success of the Gulf sturgeon's survival in the Apalachicola River and, in fact, regular floodplain inundation would increase the amount of suspended sediment and toxins in the river.

In his report reviewing the Biological Opinion, malacologist Dr. Terry D. Richardson, Ph.D., determined that the scientific record indicates that low summer flows, in fact, tend to enhance mussel reproductive success. (Attachment G). Specifically, low flows typical of summer and fall, when fat three-ridge mussels release glochidia, may tend to concentrate host fish making them more likely to be parasitized by mussel glochidia and thus enhancing mussel reproductive success. This also suggests that high flows (above what might be normally expected) might adversely affect mussel reproduction by effectively "diluting" the host fish density. Results of samples included in the administrative record indicate that the most abundant age classes of fat three-ridge mussels are those which were produced during the droughts between 1998 and 2001.

Dr. Richardson also believes that the aberrant mussel populations displaced after Hurricane Dennis would have been better served by relocation to deeper waters, a standard operating procedure for protecting threatened and endangered mussels. Since relocation is a standard FWS recommended procedure, it is difficult to understand why FWS recommends an increase in minimum discharge from 5,000 to 10,000 cfs, especially when relocation alone would suffice and remove the issue of detrimental impacts of low discharge (regardless of source) altogether. The vast majority of these mussels, at least according to FWS, previously lived elsewhere and safely survived the drought of 1999-2002 with low flows similar to those of 2006. Lastly, the subsequent studies undertaken by FWS in preparing the EDO concluded that there is "no jeopardy" to the mussels at issue as long as flows do not drop below 4,750 cfs.

III. Conclusion

Alabama Power requests the Corps and FWS, in reviewing the proposed modifications to the current IOP for the Corps' ACF reservoirs, to provide for Plant Farley's elevation and flow needs, as outlined in Section II above, both for adequate operation of the plant and for navigation. Additionally, Alabama Power reminds the Corps and the FWS of the important role navigation (and hydropower) are designed to play in the operation of the ACF reservoirs as authorized by Congress. When these purposes are met, Plant Farley's flow needs are secure. Alabama Power also requests the Corps and FWS to evaluate carefully the flow needs of the threatened and endangered species found in the Apalachicola River and to modify the IOP in order to allow the Corps to refill the upstream ACF reservoirs while also providing navigation, hydropower generation, and required minimum flows on the system for as much of the year as possible.

Thank you for your consideration. Please let us know if you have any questions.

Sincerely,

Enclosures (7)

A

October 30, 2007

Ms. Katharine A. Fredriksen
Principal Deputy Assistant Secretary
Office of Policy and International Affairs
U.S. Department of Energy
1000 Independence Ave., SW
Washington, DC 20585

Re: Information Request

Dear Kathy:

Thank you for the opportunity to provide this additional information to help you better assess the situation in Alabama, Florida and Georgia and potential electricity impacts related to the on-going drought conditions.

In response to your questions of October 23, please find the attached documents covering:

- A discussion of Southern Company's system reliability including:
    - System Operations
    - Economic Dispatch, and
    - Transmission Reliability

- A discussion regarding Plant Farley, a nuclear plant on the middle Chattahoochee owned by Alabama Power Company;

- A diagram of the Intake Structure at Plant Farley;

- A discussion regarding Plant Scholz, a fossil-fueled facility on the Apalachicola owned by Gulf Power Company;

- A diagram of the Intake Structure at Plant Scholz; and

- A map of the main river basins for the Southern System.

This response is designed to give you sufficient context for the answers to your questions. If you find that you have additional questions after your review, please do not hesitate to contact me.

Very truly yours,

L. Ray Harry

INTRODUCTION

As you are aware, the Southeast has been experiencing record drought conditions for over a year. Conditions are severe across the region, including the Apalachicola-Chattahoochee-Flint (ACF) River Basin, which runs through the states of Alabama, Georgia and Florida. The ACF River Basin is used for a variety of purposes, including navigation, electric generation, environmental flows, industrial uses, recreation and public consumption, and all three states have legitimate interests in its use.

Southern Company's public utility subsidiaries operate numerous electric-generating facilities located on several river basins in our service territory. These plants provide reliable, affordable electricity to customers in Alabama, Florida, Georgia and Mississippi. The majority of these generating assets have been impacted by the drought, and we anticipate continued challenges going forward; however, the purpose of this document is to provide some important background information and updates regarding drought impacts on a nuclear plant (Joseph M. Farley Nuclear Plant) in Alabama on the middle Chattahoochee owned by Alabama Power Company, and a fossil-fueled facility (Herbert J. Scholz Electric Generating Plant) in Florida on the Apalachicola owned by Gulf Power Company.

Prior to 2003, the U.S. Army Corps of Engineers (the Corps) operated the ACF system during low flow conditions using only two minimum-flow control points; 750 cubic feet per second (cfs) at Peachtree Creek below Atlanta to provide assimilative flows for the Atlanta wastewater discharge and 5000 cfs released from Woodruff Dam to support Gulf Power's Plant Scholz (and more recently, environmental needs in the Apalachicola River). In 2003, after significant investigation and evaluation, a Memorandum of Understanding (MOU) was developed by the states and the ACF stakeholders. The MOU was signed by the governors of Alabama, Florida and Georgia to endorse a low-flow regime with four minimum flow control points. Minimum flows of 750 cfs at Peachtree Creek below Atlanta; 1850 cfs at Columbus, Georgia; 2000 cfs below Andrews Dam in the middle Chattahoochee; and 5000 cfs below Woodruff Dam in the Apalachicola.

It is important to emphasize that the flow regime discussed above was developed by technical experts based on information provided by stakeholders in all areas of the ACF basin. The information was reviewed by the teams of utility representatives, governmental agencies, industry and environmental regulators from each state prior to being signed by the governors. The primary purpose of the MOU was to set minimum flow objectives, using a systematic, apolitical process during normal flow conditions that would balance the needs of industry and commerce in the region, protect the habitat of wildlife, and meet any legal and regulatory requirements. It was envisioned that the MOU could be used to manage flows during times of reduced flows.

SYSTEM RELIABILITY

System Operations

The Southern Company system is a vertically integrated structure comprised of:

1. generating facilities distributed across our service territory that are operated on a real time basis according to an economic dispatch regime
2. an interconnected transmission system designed to reliably deliver power to firm retail and wholesale load, and
3. a power distribution system that delivers power to Southern Company retail customers.

Economic Dispatch

The objective of economic dispatch is to operate the required amount of system generation to meet all obligations in a manner that minimizes total system production costs. Resources are dispatched based on variable cost components that include: marginal replacement fuel, variable operation and maintenance, emissions, transmission loss, and fuel handling.

Farley units 1 and 2 are nuclear-fueled units rated at approximately 888 megawatts (MWs) each, while Scholz units 1 and 2 are fueled by coal and are rated at approximately 46 MWs each. Nuclear-fueled units typically are more economical than coal units in terms of average generation cost. Considering all non-hydro resources, the Farley units are currently the lowest cost generating units on Southern Company's system.

The loss of these generation resources would have a significant impact on total production costs. It is estimated that the loss of these resources would increase total production costs by approximately $1,500,000 per day.

Transmission Reliability

Southern Company Transmission is responsible for the operation and control of transmission, its inputs (generation) and outputs (serving load) in a manner that is safe, reliable, and in compliance with reliability standards as approved by the Federal Energy Regulatory Commission (FERC) and enforced by North American Electric Reliability Corporation (NERC) and its regional entity, the Southeast Electric Reliability Corporation (SERC). Generation dispatch is planned in advance on a forward basis. In real time, the transmission function monitors the implementation of the plan and directs adjustments to ensure that generation and loads are properly balanced and the system is in compliance with NERC standards. Aside from the obvious reliability risks, non-compliance is subject to FERC's civil penalty authority.

Like all other generation controlled by Southern, Plant Scholz is planned to operate when economic dispatch indicates it is the next economic choice. There are two situations where transmission operations require Plant Scholz to operate to avoid interruption of service to customers or non-compliance with NERC Standards. At high system loads, Plant Scholz is required to operate to prevent thermal overloading of certain lines should a contingency event occur. At low system loads, Plant Scholz is required to operate to maintain voltages within acceptable limits.

During off-peak periods (October-May) when maintenance is performed on critical generation and transmission assets, Southern Company cannot reliably serve our customers without the availability of both units at Plant Farley.

There are potential physical solutions to the problems in the aforementioned situations and we are currently evaluating their effectiveness and feasibility. While we cannot speak with certainty without a detailed study of scenarios, we believe that our system would be significantly encumbered if we were not able to utilize generation at Plant Farley.

PLANT FARLEY

Background and System Operations

The Joseph M. Farley Nuclear Plant is located along the Chattahoochee River near Dothan in southeast Alabama. The plant consists of two Westinghouse Pressurized Water Reactor (PWR) units capable of generating 888 megawatts (MW) for a total capacity of 1,776 MW. Approximately 900 employees oversee the plant's operation 24 hours a day, 7 days a week. Plant Farley accounts for 19 percent of Alabama Power's total electricity generation.

Plant Farley withdraws approximately 97,000 gallons per minute (gpm) from the Chattahoochee River during normal operation to feed the service water pond utilized as the ultimate (emergency) heat sink and support once-through cooling and make-up to cooling towers for main condenser cooling. The intake system consists of an intake canal which extends 200 feet from the Chattahoochee River to the intake structure. Its three intake bays are equipped with three-eighths inch mesh vertical traveling screens. Ten pumps force water from the river to an approximately 108-acre storage pond (Service Water Pond). A diagram of the intake structure is attached on page 7.

Water for normal operation is withdrawn via a second intake structure located on the Service Water Pond to support the once-through service water system and provide makeup for the cooling towers. Normal operation of both Farley units requires operation of eight of the ten available service water pumps for 80,000 gpm. The Service Water system utilizes this once through flow to reject heat from nuclear safety-related cooling systems. A portion of the flow from the Service Water system is routed as makeup to supply the cooling towers. The cooling towers have a total volume of nearly five million gallons, with a flow rate of 720,000 gpm. The cooling towers require 35,600 gpm as makeup during normal two-unit operation to disseminate heat from the main condensers for both Farley units. The cooling towers have evaporation and drift losses of 25,400 gpm and a blowdown rate of 10,200 gpm. The combined blowdown from both Farley units and the remainder of the once through service water is combined into a single discharge line routed to the Chattahoochee River. The Service Water Pond serves as the ultimate (emergency) heat sink for the Farley plant, providing an adequate volume of water to support safe shutdown of both Farley units, in the event the river water pumps are not available.

The Farley discharge is controlled by a National Pollutant Discharge Elimination System (NPDES) Permit issued by the Alabama Department of Environmental Management (ADEM). The permit contains limits and requirements to ensure the thermal discharge and chemical constituents in the effluent meet applicable water quality standards. At 2,000 cfs flowing past Farley, there are no significant thermal or chemical impacts resulting from Farley's discharge. If flows were reduced below 2,000 cfs for an extended period, then an evaluation of the impacts of the discharge would be required by Southern Company, state environmental agencies and potentially the Nuclear Regulatory Commission (NRC). The bases for regulatory decisions in environmental permits may require re-evaluation to confirm permit limits and that water quality standards are met. Farley also discharges small quantities of radwaste through the discharge line in strict compliance with NRC operating license conditions. Farley monitors the discharge for a wide array of radionuclides and releases are based on both nuclide concentration as well as dose.

Changes in river flow would prompt NRC review of operating license provisions to confirm acceptability of continued operations.

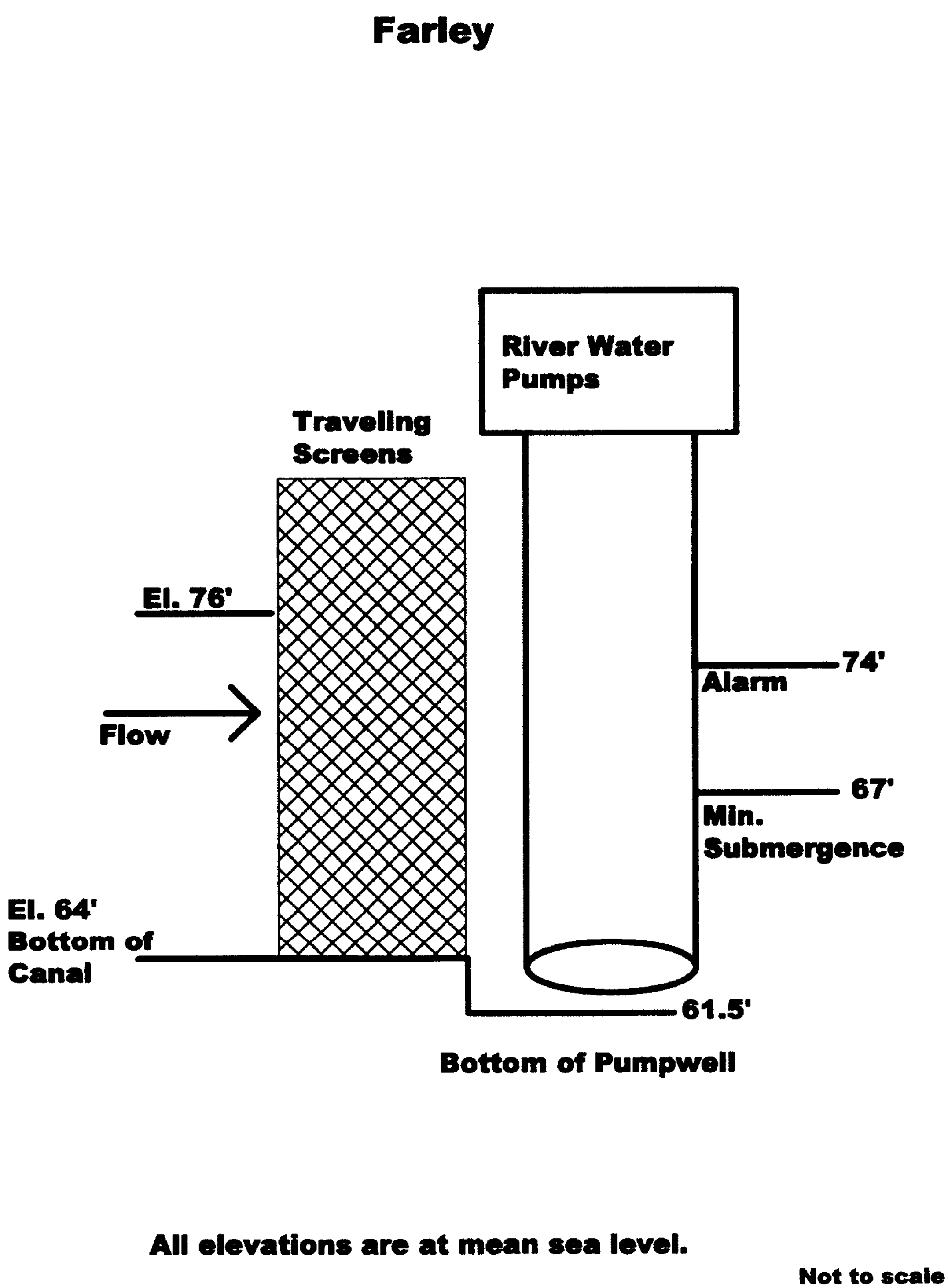
The Farley intake structure is located on the Woodruff reservoir at the end of a 200 foot long canal and water is withdrawn by a combination of ten pumps operating in pump wet pits located in three intake bays. The bottom invert elevation of the canal is 64 ft MSL. Normal water elevation at Farley averages 77 ft MSL with the reservoir operation ranging from a normal minimum of 76 ft MSL to a normal maximum of 78 ft MSL. The 76 – 78 ft MSL elevation encompasses all of the available reservoir storage and the reservoir operates as run-of-river below that point. The Farley pumps reach their net positive suction head (NPSH) at 67.5 ft MSL. The environmental effects of operation below 74.5 ft mean sea level (MSL) have not been determined and evaluation will be required before operation at these reduced levels.

Impact of Reduced Flow and River Levels

Flows at Farley are provided by releases from hydropower generation at the Walter F. George Dam located approximately 29 miles upstream, with that water passing through the George Andrew Lock and Dam approximately four miles upstream from Plant Farley. Power generation normally produces flows in excess of 20,000 cfs and occurs up to seven hours each weekday. Once hydro generation ceases, the dam only passes leakage flow (flows passing over, under or through a dam or lock that are not accounted for in flow measurements) for the balance of the day. Weekend flows normally consist of leakage and local inflow only. The leakage flow has been defined by the Corps as approximately 800 cfs instantaneous. After passing Plant Farley, the flow continues down the Chattahoochee River and merges with the flow from the Flint River above Jim Woodruff Dam to form Lake Seminole. It is important to note that because Plant Farley is located on the Chattahoochee River above the point where the Flint merges with Lake Seminole, the inflows from the Flint River are not available for Farley use.

Southern Nuclear defines 2000 cfs and 74.5 ft MSL as the minimum conditions necessary for long term operation at Farley. Plant Farley can operate for short periods (a few days) below 2000 cfs flow, but extended operation below this flow level will require evaluation to determine the environmental and operational impacts.

As stated above, the Farley intake canal is located on the Woodruff Reservoir with the reservoir having a small amount of storage capability and generally operating between elevation 76 and 78 ft MSL. Southern Company has analyzed environmental and operational impacts under prior drought conditions and confirmed river elevation of 74.5 ft MSL as the minimum necessary for long-term operation at Farley. Operation below this level would require evaluation to determine the environmental and operational impacts as discussed earlier.


Farley
River Water
Pumps
Traveling
Screens
El. 76'
Flow
74'
Alarm
67'
Min.
Submergence
El. 64'
Bottom of
Canal
61.5'
Bottom of Pumpwell
All elevations are at mean sea level.
Not to scale

PLANT SCHOLZ

Background and System Operations

The Herbert J. Scholz Electric Generating Plant is a coal-fired power plant located on the Apalachicola River in northwest Florida. The plant consists of two generating units with a total nameplate generating capacity of 92,000 KW and has 31 Gulf Power employees. Scholz began commercial operations in 1953 and produces enough electricity to power approximately 19,000 homes.

The plant withdraws approximately 129 million gallons of water per day or approximately 200 cfs from the Apalachicola River primarily for non-consumptive, once through cooling purposes. The plant has a 500 foot long intake canal connecting the river with the intake structure. River water flows through the canal to the water intake structure and traveling screens then flows to an area directly beneath the plant's pump room which houses the cooling water pumps. The cooling water pumps pull the river water from the intake tunnel via submerged pump impellers. Most of the water is pumped through the steam turbine condenser, a large heat exchanger located above the pump room. The river water then travels through the circulating water system, absorbs heat from the steam circulating through the condenser and is returned to the river in its original condition at a slightly higher temperature. Without a sufficient supply of cooling water, the plant cannot operate. A diagram of the intake structure is attached on page 10.

The Scholz discharge is controlled by an NPDES Permit issued by the Florida Department of Environmental Protection. The permit contains limits and requirements on the plant cooling water discharge to ensure state water quality standards are met. Extremely low river levels increase cooling water velocities in the intake canal. This increases the potential for sediments from the river bottom to be picked up in the cooling water and discharged back to the river where it remains in suspension. This increase in suspended sediments can cause violations of various state water quality standards.

To maintain normal operations at Plant Scholz, the cooling water pumps at the plant require a minimum river elevation level at the plant intake structure of 38 ft MSL. Based on information from the Corps, it is our understanding that 38 ft MSL equates to a constant flow of 5,000 cfs in the Apalachicola River at Plant Scholz. The cooling pumps take suction at 33.5 ft MSL and the pumps are designed to operate with 4.75 ft of NPSH, equating to a river level of 38.25 MSL. The plant is presently operating slightly below design at only 4.5 ft of NPSH, and any further decrease in level is expected to cause the pumps to cavitate.

Impact of Reduced Flows and Lower River Levels

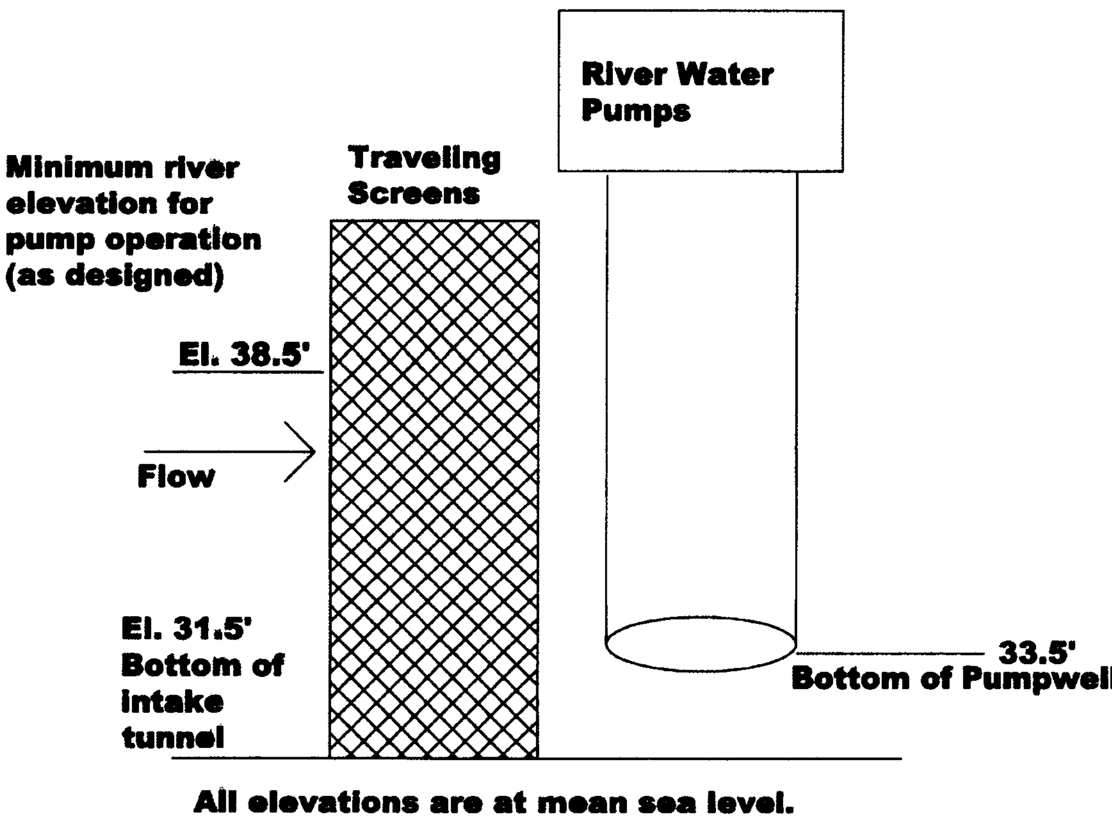
Plant Scholz is just downstream of the Jim Woodruff Dam and Lake Seminole, which receive their flows from the Chattahoochee and Flint Rivers. As stated, minimum flow for normal operations is 5000 cfs resulting in 38 ft MSL at Plant Scholz. The plant has operated on a temporary basis at levels down to 37.5 ft MSL or an equivalent flow of 4200. As river levels decrease, the chances increase that either there will be no water in the intake canal or the river level will not be adequate to provide suitable pump suction for the cooling water pumps to operate.

There is a possibility that Plant Scholz can maintain temporary operations with the flows of 2000 cfs from the Chattahoochee near Farley Nuclear Plant plus the approximately 1200 cfs from the Flint River or a total of 3200 cfs. We anticipate that these combined flows should equate to between 36.5 and 36.8 ft MSL at Plant Scholz. Plant Scholz has never operated at intake levels lower than 37.5 ft MSL; in the event we are able to operate the plant below 37.5 ft MSL, we will be increasing operational risk as well as increasing the possibility of violation of the state water quality standards. Based on our calculations, 37.5 ft MSL at Plant Scholz would require 4200 cfs in the Apalachicola River. That may require 3000 cfs on the Chattahoochee River at Plant Farley if 1200 cfs were coming from the Flint River.

There is a great deal of uncertainty regarding the impact of making temporary plant modifications. Any deviation from normal operations to accommodate the lower flows and river levels will require testing to determine that impact. There is not a reduced operating load where the units can operate and any flow corresponding to a river level below 36.5 ft MSL would most likely result in the plant shutting down. While other options are possible, they require costly and untested plant modifications to Plant Scholz and permitting that normally could take up to one year. Again, these options could only be temporary in nature.

INTAKE STRUCTURE AT PLANT SCHOLZ

Scholz



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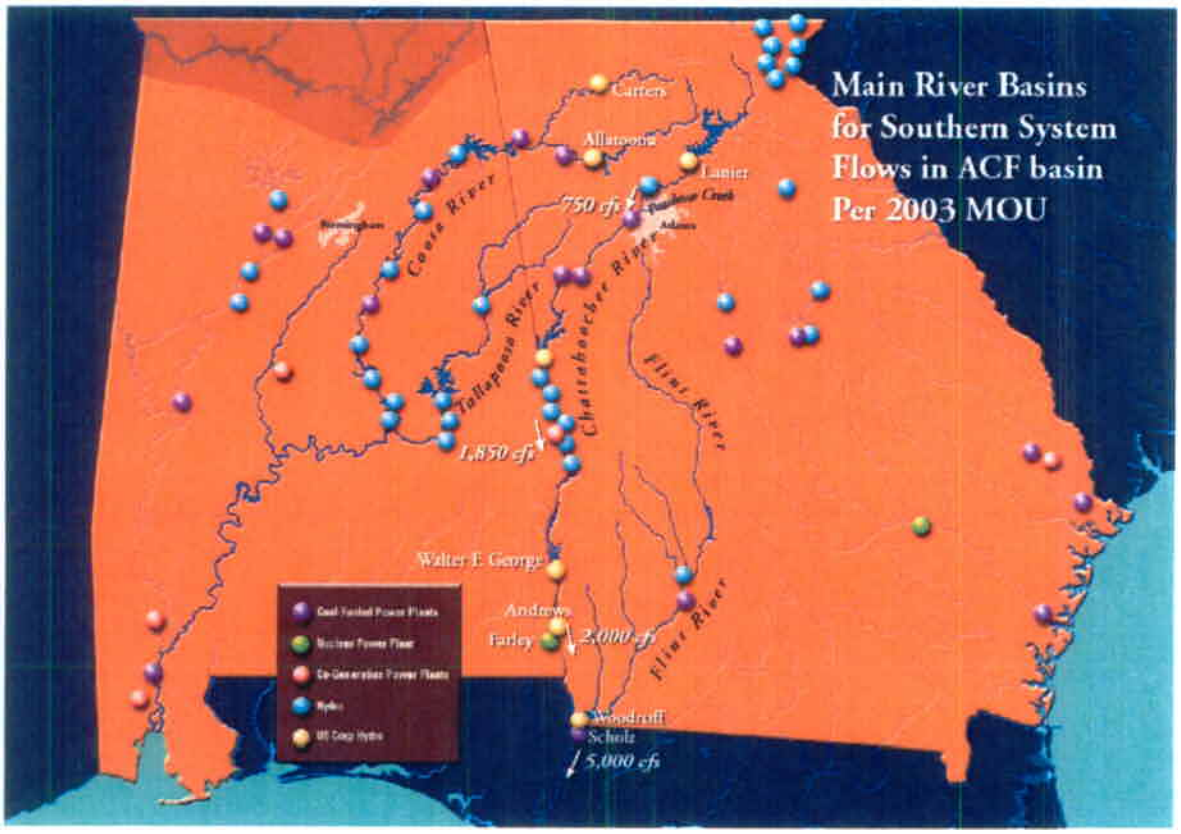
MAIN RIVER BASINS FOR THE SOUTHERN SYSTEM



B

Final

environmental statement

CT-III-7

related to construction of

JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 and 2

ALABAMA POWER COMPANY

DOCKET Nos. 50-348 and 50-364

June 1972

UNITED STATES ATOMIC ENERGY COMMISSION

DIRECTORATE OF LICENSING

The Chattahoochee is no longer a natural stream. Many dams have been constructed on it to make reservoirs for flood control, water power, and navigation. One of the largest reservoirs is the Lake Sidney Lanier (Buford Dam) just north of Atlanta, some 200 miles north of the site, which is used for flood control and electric power. Coming down stream there are also the Morgan Falls Dam, the West Point Dam, the Bartlett Dam, the Goat Rock Dam, and the Oliver Dam. The Walter F. George Dam, 31 miles upstream from the site, forms Lake Eufaula and is used for water power, flood control, and navigation. Lake Eufaula is navigable as far as Columbus, Georgia, some 75 miles north of the site. The Columbia Lock and Dam is located 3 miles north of the site and is used for flood control and navigation, but not for water power. The Jim Woodruff Dam, 44 miles downstream from the site just north of the Georgia-Florida boundary, is the most southerly of the dams. It dams the Flint River as well as the Chattahoochee and forms Lake Seminole, which covers more than 37,500 acres. The headwaters of this lake back up the Chattahoochee as far as the Columbia Lock and Dam, so that the river at the Farley station site is actually the headwaters of Lake Seminole rather than a normal river.

Records of stream flow were kept at Columbia, Alabama, starting in 1928. The minimum daily flow, before construction of the Columbia Lock and Dam in 1960, was 1210 cfs (542,000 gpm) in 1954, a record dry year. At present the regime of the river is much changed by the completion of Columbia Dam and the Walter F. George Dam in 1964. It is the controlled discharge of these dams that controls the low stage flow of the river, and also the discharge of the Jim Woodruff Dam and the stage of Lake Seminole. The level of Lake Seminole, and hence the level of the river at the station site, is held no lower than 76 ft msl to provide a minimum depth of 9 ft in the navigation channel. Since the completion of the Columbia Dam and the Walter F. George Dam, the minimum observed flow at Columbia Dam was 1760 cfs, but the Walter F. George Dam at that time was storing water. Due to the expected flooding of the gage at Columbia by Columbia Reservoir, a gage was established in 1960 at Alaga, Alabama, about 8 miles downstream from the station site. The lowest flow so far recorded by this gage was 1230 cfs (552,000 gpm) in October 1962, but at this time also the reservoirs upstream were being filled. It is possible, but unlikely, that at some future time the river flow at the station site will briefly be zero, because of regulation of the dams. This will have little, if any, effect on the station, because the river stage must be maintained at 76 ft msl, and this will provide ample water for the station. A more complex problem is the minimum flow that should be used in determining the dilution of discharges from the station. An examination of the record[19] suggests that a flow of 2000 cfs (900,000 gpm) will be exceeded 90 to 95% of the time.

C

Final

environmental statement

related to operation of

JOSEPH M. FARLEY NUCLEAR PLANT UNITS 1 AND 2

ALABAMA POWER COMPANY

DOCKET NOS. 50-348 AND 50-364

UNIT

that the economic growth will continue after the Farley Plant has been constructed. The plant will have an operating staff of approximately 150 employees who will remain as permanent residents. It was emphasized that the financial benefits from the plant (especially taxes) will be needed to maintain the utilities and services required for the growth of the county and city (2).

2.3 Hydrology

2.3.1 Chattahoochee River

The Corps of Engineers retains controls over the operation and maintenance of the entire Chattahoochee - Flint - Apalachicola River system. Continuous surveillance is maintained over Lake Seminole, the portion of the Chattachoochee River which is most directly affected by the Farley Plant, as well as over other reservoirs upstream and downstream. The staff has made extensive use of the Corp's recent Environmental Impact Statement for this river system (3) in assessing the current use of Lake Seminole. There is no evidence that Lake Seminole and the other reservoirs on the Chattahoochee have been affected by the construction of the Farley Plant. A 100-foot wide channel is maintained at a depth of nine feet by dredging; however, the Corps now places the dredging spoil in diked areas above high water level. One of these spoil areas is on the east side of the Chattahoochee between the Farley site and the Andrews Lock and Dam (formerly Columbia Lock and Dam). The Corps of Engineers also continually removes debris that might interferewith boat and barge traffic. These and other recent activities, such as the impounding of much of the Apalachicola River, have caused both qualitative and quantitative changes in the aquatic biota of Lake Seminole during the past decade (3).

Local fishermen report that sports fishing remains very good in this lake in the vicinity of the Farley site (2). The value of the river for recreational purposes is evident from a compilation of visitations to Andrews Lake wherein the number of visitors is shown to have increased from 30,000 in 1964 to 265,164 in 1971 (3).

Recent investigations have been made by the applicant to determine the extent to which the river water downstream of the Farley Plant is used through withdrawal. A résumé of the applicant's findings (4) (ER-OL-Amend 1 P 2.2-1) is presented in Table 2.2.

D

Memorandum of Understanding
Regarding Initial Allocation Formula for the
ACF River Basin

WHEREAS, the States of Alabama, Florida and Georgia, along with the United States of America, are signatories to the Apalachicola - Chattahoochee - Flint River Basin Compact, (ACF Compact);

WHEREAS, the ACF Compact authorizes the States of Alabama, Florida and Georgia to develop an allocation formula for equitably apportioning the surface waters of the ACF Basin among the States; and it is the intent of the states that this formula will be consistent with the ACF Compact;

WHEREAS, the States of Alabama, Florida and Georgia have reached substantial agreement in principle regarding many of the terms of an allocation formula;

WHEREAS, the ACF Compact and the Operating Guidelines of the ACF Commission require the input of the public through public hearings and written comments prior to the adoption by the ACF Commission of an initial allocation formula;

WHEREAS, the ACF Compact requires that the allocation formula is subject to review and concurrence by the federal commissioner, and it is desirable to facilitate that review in a timely manner; and

WHEREAS, the States of Alabama, Florida and Georgia desire to express and commemorate their preliminary agreement to certain concepts in advance of the issuance of a draft initial allocation formula for public comment and federal review.

NOW, THEREFORE, IN CONSIDERATION OF THE FOREGOING, the States of Alabama, Florida and Georgia hereby agree to the following principles of an allocation formula:

1. Performance under the allocation formula shall begin when authorization for allocation of storage in Lake Lanier for 705 mgd for water supply has occurred, and the Corps has issued contracts for such use. Until the date on which performance commences, the Corps will operate the federal reservoirs consistent with the principles of the allocation formula to the maximum extent practicable.

2. The signatory states will begin negotiations to extend or modify the allocation formula no later than December 31, 2035.

3. **Notice to terminate 2038**
   Expiration 2040

Effect after Termination

Neither the fact that the Signatory Parties have executed this Agreement nor the terms of this Agreement shall create any inference or presumption that such execution or terms would constitute an equitable apportionment of the surface waters of the ACF Basin after the expiration of this Agreement or termination of the ACF Compact.

4. The following flow requirements will be included in the allocation formula, and are intended to be met by the combined actions of maintaining waters uses consistent with the allocation formula, and by the Corps operating the federal reservoirs consistent with the allocation formula.

   a. On the Chattahoochee River above its confluence with Peachtree Creek, a flow of 750 cfs will be maintained on a daily basis, with the understanding that the State of Georgia is entitled to a variable flow regime that requires no less than 650 cfs in winters, and flows higher than 750 cfs in summers, provided that an annual average of 750 cfs is obtained from such a variable flow regime.

   b. On the Chattahoochee River at Columbus, Georgia, a flow of 1350 cfs will be maintained on a daily basis at all times, and a flow of 1850 cfs will be maintained on a weekly basis provided that the top of the storage pool in West Point Reservoir is above 621.6 feet.

   c. On the Chattahoochee River at Columbia, Alabama, a flow of 2000 cfs will be maintained on a daily basis.

   d. On the Apalachicola River at Chattahoochee, a minimum flow of 5000 cfs will be maintained on a weekly basis at all times. Monthly flows will be maintained at quantities that are determined by the composite storage levels in West Point Lake and Lake Walter F. George, and by a determination of whether drought relief is in effect. Table 1 sets the applicable minimum monthly flow requirements when drought relief is not in effect. Table 2 sets the applicable monthly flow requirements when drought relief is in effect. Table 3 lists the reservoir storage quantities which determine which set of monthly flow requirements at Chattahoochee is applicable. It is not the states' intent to over release to meet monthly flow requirements.

5. The formula will provide drought relief in any month when the following conditions exist:

   There is an indication of climatic drought, demonstrated by the following facts having existed in the prior month:

- The ACF Basin Weighted 12-Month Standard Precipitation Index was –1.26 or less;

AND

- The ACF Basin Weighted Hydrologic Palmer Index was -2.37 or less;

6. Georgia shall impose in the relief month the terms and conditions described in the published Georgia Drought Management Plan as appropriate for the existent level of drought.

7. The agreement shall consider and include the use of Lake Lanier as feasible and appropriate. West Point Lake, Lake Walter F. George and Lake Seminole shall be used to support all the flow requirements at Chattahoochee, FL.

8. The allocation formula will explicitly address future uses of water in the manner set forth below.

   a. The states will support authorization for allocation of storage in Lake Lanier for 705 mgd (annual average) for water supply. Consideration will be given to additional water supply in excess of 705 mgd.

   b. Of water withdrawn for municipal purposes within the Chattahoochee Basin above the Whitesburg gage and within the Corps jurisdictional boundary of Lake Lanier in Georgia, no less than 58% on an annual average basis shall be returned to the Chattahoochee River Basin and accounted for at Whitesburg.

   c. No water from the Chattahoochee River below Whitesburg may be exported for use above Whitesburg.

   d. All new water supply reservoirs with a storage capacity in excess of 500 acre feet shall be required to meet the instream flow requirements that are specified in the laws, regulations and policies of the state in which the reservoir is located.

   e. The states shall request and support raising the top of the conservation pools of Lake Lanier by 1 foot in all months and raising the top of the conservation pools of Lake Seminole to 78 feet above mean sea level. The states shall further request and support adjusting the top of the conservation pools of Lake Walter F. George and West Point Lake and zonal elevations of all four federal reservoirs to levels mutually agreed to by the states.

   f. There shall be no new transfers from the Flint River Basin to the Chattahoochee River Basin other than those that have state or federal permits as of the date of execution of this Memorandum of Understanding.

9. An adaptive management process will be established which will facilitate the implementation of the formula, and which will provide a foundation for potential changes to the formula. However, no changes to the formula resulting from a, b, c or d below shall be made except with the unanimous approval of the ACF Commission.

   a. The adaptive management process will include the following elements:
      - Comprehensive gathering of extant information on the water and water-dependent biologic resources of the ACF Basin;
      - Special studies of issues important to management of basin resources;
      - Analysis and interpretation of this information to establish cause-effect relationships and to identify conditions in which there is a need or opportunity to manage and use the resources more effectively; and,
      - Adaptation of basin management to accomplish this more effective resource management.

      The adaptive management process will make use of a Science Advisory Panel and of public participation.

   b. The formula will provide for using the Water Control Plan as one basis for implementing the terms of the formula.

   c. The formula will provide for development of a Drought Management Plan. Modifications to the Drought Management Plan will be accomplished through adaptive management.

   d. The agreement will provide for relief to a state in the event of unanticipated conditions.

10. The agreement shall include a provision governing the shared use of the surface water of the Chattahoochee River along the shared border between the states of Alabama and Georgia, including provisions regarding the issuance of permits for the withdrawal of surface water and discharge of treated wastewater by the state in which the person using the surface water or discharging the wastewater is located.

11. The agreement shall include a provision regarding commercial navigation in the Basin under such terms and conditions, as the states may deem reasonable and consistent with the remaining provisions of the agreement.

12. The States of Alabama, Florida and Georgia commit to work diligently to prepare a draft initial allocation formula agreement that incorporates the above concepts and such other terms upon which the States agree. Upon completion of the draft initial allocation formula, the ACF Commission Secretary shall provide copies of such draft initial allocation formula to the public, shall provide notice of a public comment period on the initial draft allocation formula, and shall establish dates for public hearings on the draft initial allocation formula in accordance with the ACF Commission Operating Guidelines.

13. The signatory states recognize the need to stay the litigation pending in Alabama, the District of Columbia and Georgia during the drafting of the agreement.

Approved and adopted this 22 day of July 2003.

Bob Riley
Governor Bob Riley
State of Alabama

7-22-03
Date

Jeb Bush
Governor Jeb Bush
State of Florida

7-22-03
Date

Sonny Perdue
Governor Sonny Perdue
State of Georgia

7-22-03
Date

E

Evaluation of the Corps of Engineers Interim Operations Plan

For the ACF Basin

The Interim Operating Plan

This report reviews certain operational aspects of the U. S. Army Corps of Engineers, Mobile District (USACE) interim operations plan dated September 7, 2006, as revised March 23, 2007, (IOP), including the temporary exceptional drought operations plan dated November 15, 2007 (EDO), and the proposed April 15, 2008 modifications of the current IOP (MIOP). [1]

Shortcomings of the IOP

The IOP adopted by the USACE increases flows below Jim Woodruff Dam at the expense of other multi-purpose benefits which should be provided by the upstream projects. The IOP provides for higher releases in the March to May time period when a larger portion of the inflows into the ACF basin should be retained in the upstream storage projects to help meet other multi-purpose objectives later in the year. This is particularly true in years where inflows are below normal. Under the rules of the current IOP, during extended dry periods or drought conditions, there is not enough leeway to allow the upstream projects to store water to benefit other multi-purpose benefits later in the year. This lack of storage affects the ability to maintain higher minimum flows and maintain higher pool levels for other project purposes. If additional water were allowed to be stored, then the releases would be higher in the June to September time period. This would improve water quality and water supply during critical times of the year and increase the quantity of hydro-generation, particularly during the high demand summer period This potential increase in value of hydro-generation would not only occur at the USACE projects, but those owned by Georgia Power Company as well. Allowing the upstream projects to store additional water in the March to May time period will also help ensure at least some refilling to near normal levels in consecutive years with below normal inflows. The storing of additional water during the March to May time period can also be accomplished without significantly impacting the endangered species downstream of Jim Woodruff Lock and Dam.

In the March to May time period the upstream storage projects, Buford, West Point and W. F. George, are scheduled to raise water levels from winter flood control pools to

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[1] Copies of USACE descriptions of the IOP, EDO, and MIOP are available on line at http://www.sam.usace.army.mil/ACF.htm.

higher summer pool levels. At Buford dam the average pool level on March 1 is approximately elevation 1068. Based on the USACE current operating zones, this would put West Point at around elevation 627 and W. F. George at elevation 187.5. Target summer levels for these projects are 1071, 635, and 190, respectively. The amount of water required to raise these projects to summer levels by June 1 is approximately 203,480 day-second-feet (dsf), see Figure 1 below.

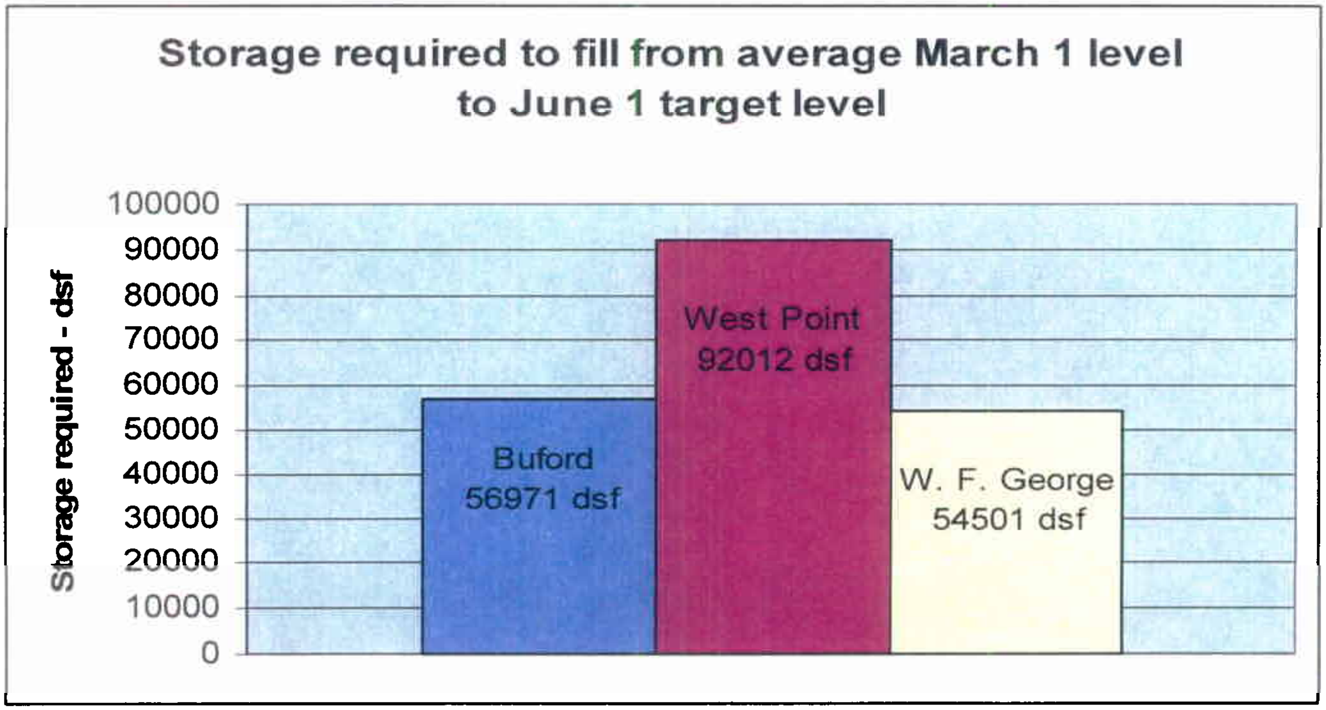

Figure 1

In fact, both West Point and W. F. George pool levels are scheduled to fill a minimum of two feet in the month of May based on their operating curves. This would require storing at least 69,000 dsf during the month of May alone. In examining the hydrologic inflows for the month of May only in the ACF basin from 1976 to 2007, only 14 of the 32 years or 44 percent of the time were the May inflows high enough under the IOP to be able to fill both the West Point and W. F. George reservoirs. This of course, assumes no additional storage is required at Buford Dam and the inflows are such that the water can be stored in the upstream projects. In 14 out of the 32 years of record, there was an opportunity to store less than 10,000 dsf, 15 percent of the water required to reach the targeted June 1 levels. And in 11 of those 14 years, or approximately 34 percent of the time, there were essentially no opportunities to store water in the upstream projects based on the IOP operating guidelines. See the Flow-Duration Curve showing Potential Storage for the May Inflows in Figure 2 below.

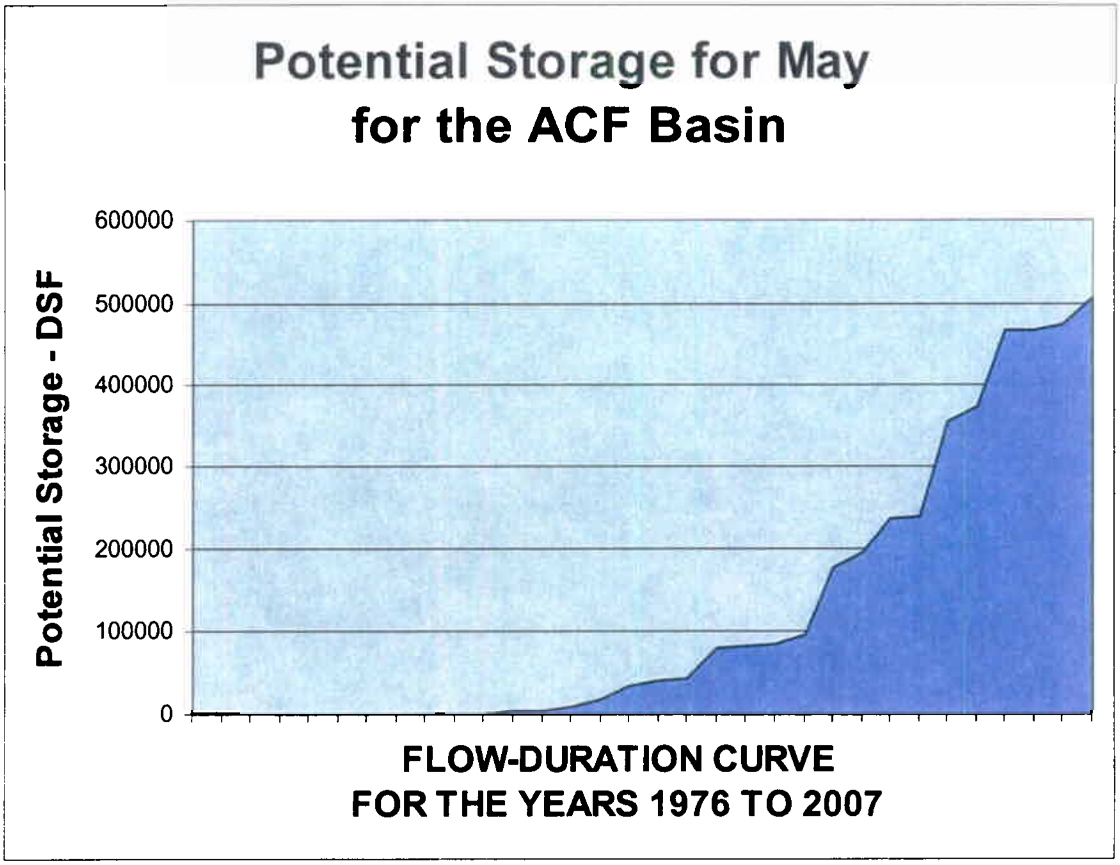

Figure 2

Based on the IOP, the average inflow into Jim Woodruff Dam must be above 25,710 cfs (70 percent of 25,710 cfs is 18,000 cfs) before any significant amount of water can be stored in the upstream projects. If hydrologic inflows are less than 25,710 cfs, the IOP allows only the difference between the inflow and 18,000 cfs to be stored upstream. Also, if significantly high inflows occur early in the period, not all of this additional water can be stored due to flood control requirements. A perfect example of this occurred in early March of 2007. Although inflows were high enough to allow potential storage of water under the rules of the IOP in the upstream projects, flood control guidelines for the reservoirs did not allow this water to be stored, see Figure 3. Adhering to the operating guides for flood control resulted in the release of over 81,100 dsf above what was required by the IOP guidelines in only a 9 day period. As a result, pool levels at Buford Dam only rose 0.47 foot from March 1 to May 31, 2007. Pool levels at West Point and W. F. George actually fell 0.15 foot and 2.34 feet, respectively.

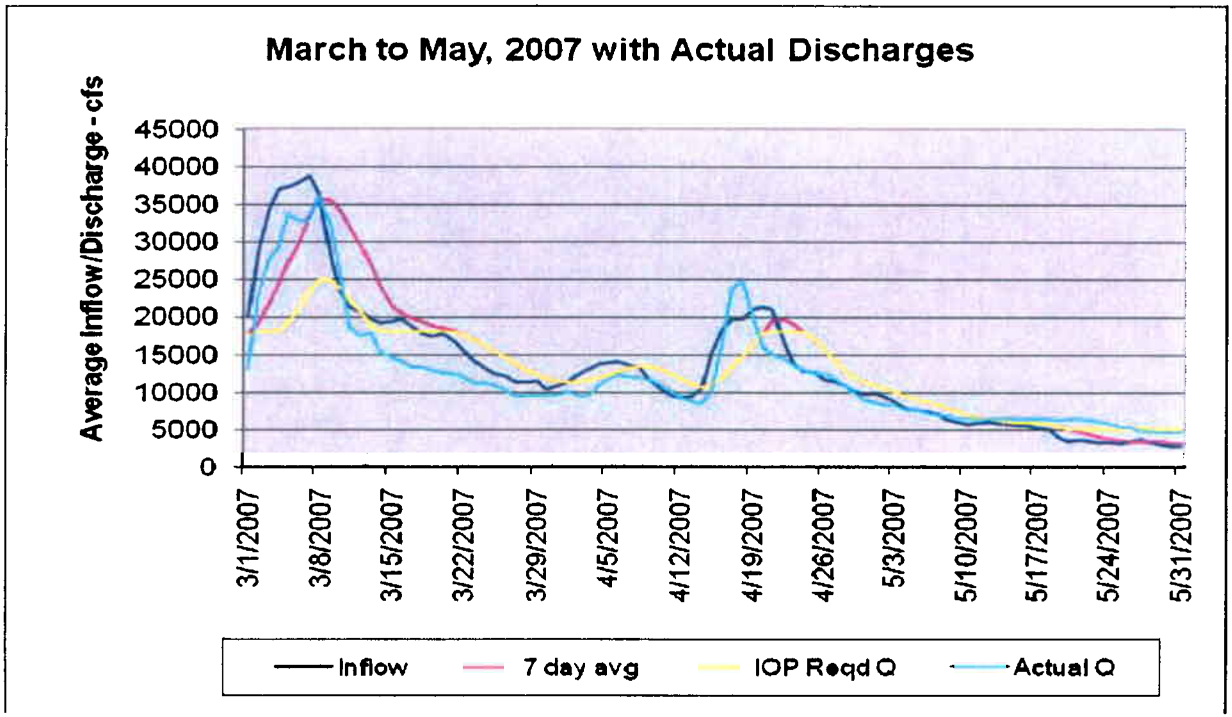

Figure 3

By examining the inflows into Jim Woodruff Dam over the past eleven years, it is easy to find potential pitfalls with the IOP, particularly in relatively dry years. No sophisticated "modeling" is required. Figure 4 below is a graph of the hydrologic inflows into Jim Woodruff Dam from January 1, 1997 until May 31, 2007. The hydrologic inflow data was obtained from the USACE, Mobile District and was used in the following analysis. The analysis uses the observed inflows into ACF drainage basin and looks back at the years 1997 to 2007 and assumes the operating rules of the IOP would have been used. The following assumes a "best case scenario" for the ability to store water. As shown above for the year 2007, this may or may not have been the case.

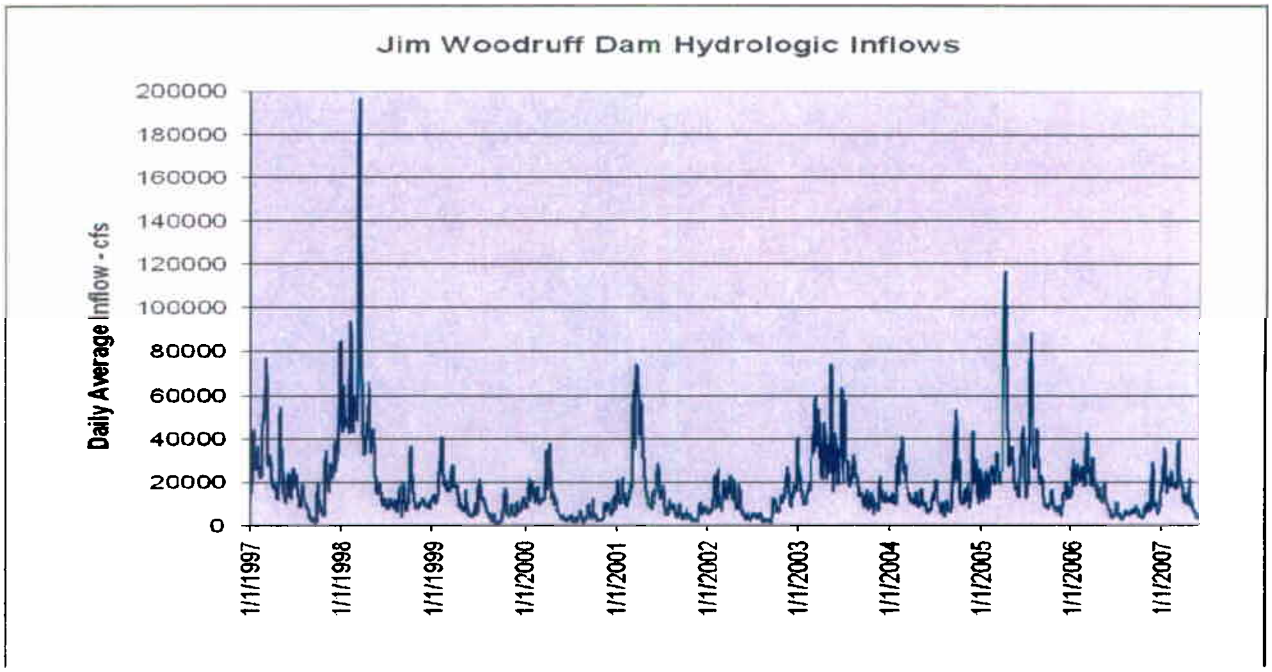

Figure 4

In 1997, there would have been an opportunity to store water in the upstream projects for most of March, a few days in April and the early part of May. However, essentially after May 13, the system would have been passing inflows (holding pool levels steady). This means the pool levels at West Point and W. F. George would have possibly remained stable for the last 18 days of May, filling only one foot instead of two feet.

1998 would have been one of the better operating years under the IOP, but again pool levels would have remained fairly stable for the latter part of May.

The years 1999, 2002, and 2004 demonstrate how the IOP fails to store sufficient water to provide other multi-purpose benefits. There were only 13 days in the March to May time period for the year 1999 when the IOP would have allowed storing more than 1,000 cfs and all of these occurring in March. During this period of time, only 61,998 dsf could have been stored under the best conditions, only 30 percent of the amount required, see Figure 5. Note – on the following graphs, if the IOP required discharge (IOP reqd) matches the 7 day average inflow (7 day avg) the graph will only show the IOP required discharge. The difference between the 7 day avg and IOP required lines on the graphs show the opportunities to store water in the upstream projects.

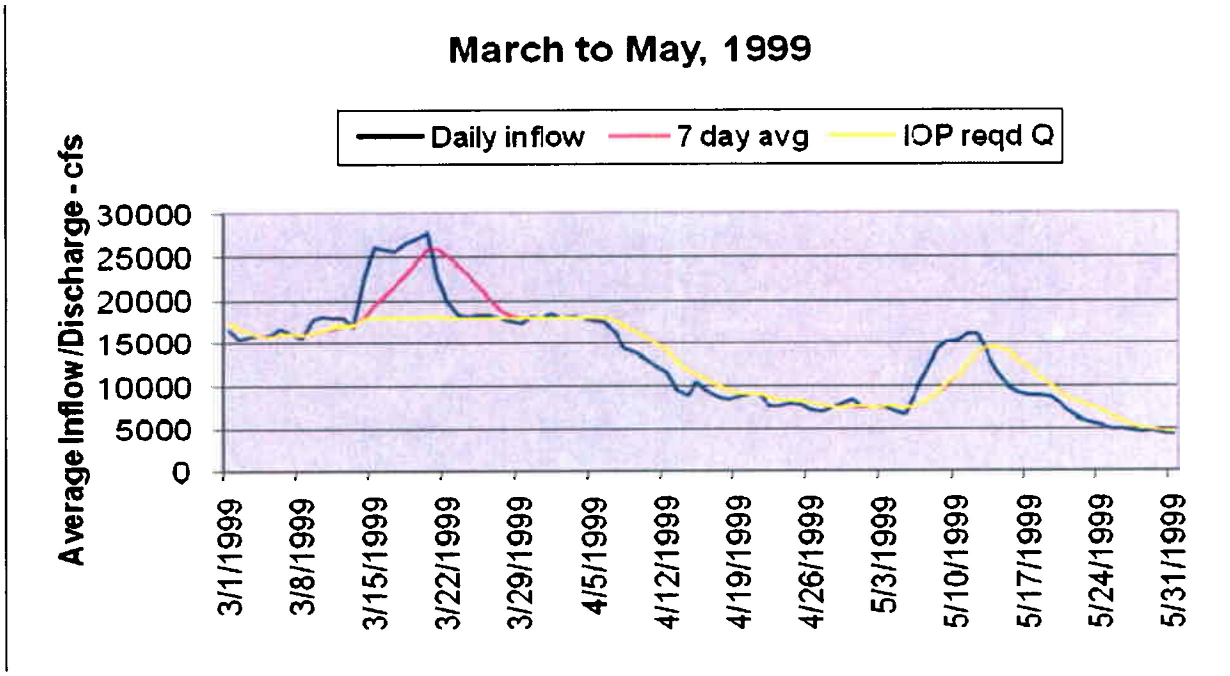

Figure 5

In 2002, there were only 7 days the ACF basin could have stored more than 1,000 cfs. A total of only 17,244 dsf could have been stored in the upstream projects, only 8 percent of the water necessary to reach target pool levels, see Figure 6. If one assumes the three storage projects would have been at the "average" pool levels on March 1, 2002 and the pool levels were then "balanced" on June 1, this would result in the following: Buford reservoir would have actually been drawn down 0.7 foot, West Point would have risen 3 feet, but still be 5 feet below the June 1 target level, and W. F. George would still be at elevation 187.5, see Figures 7, 8 and 9.

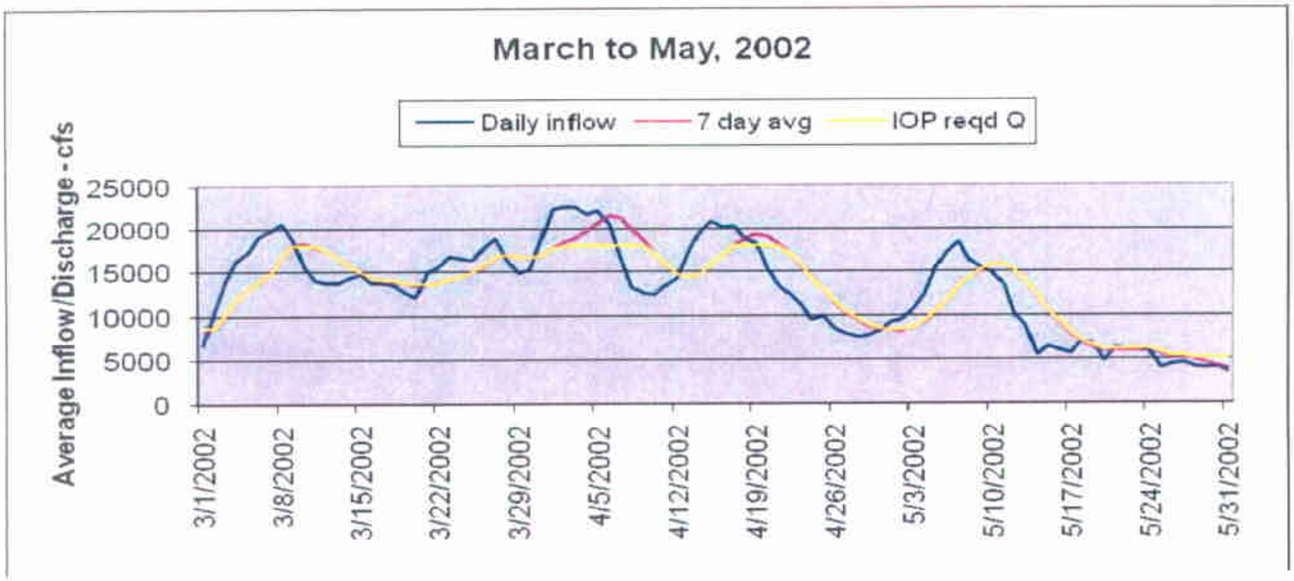

Figure 6

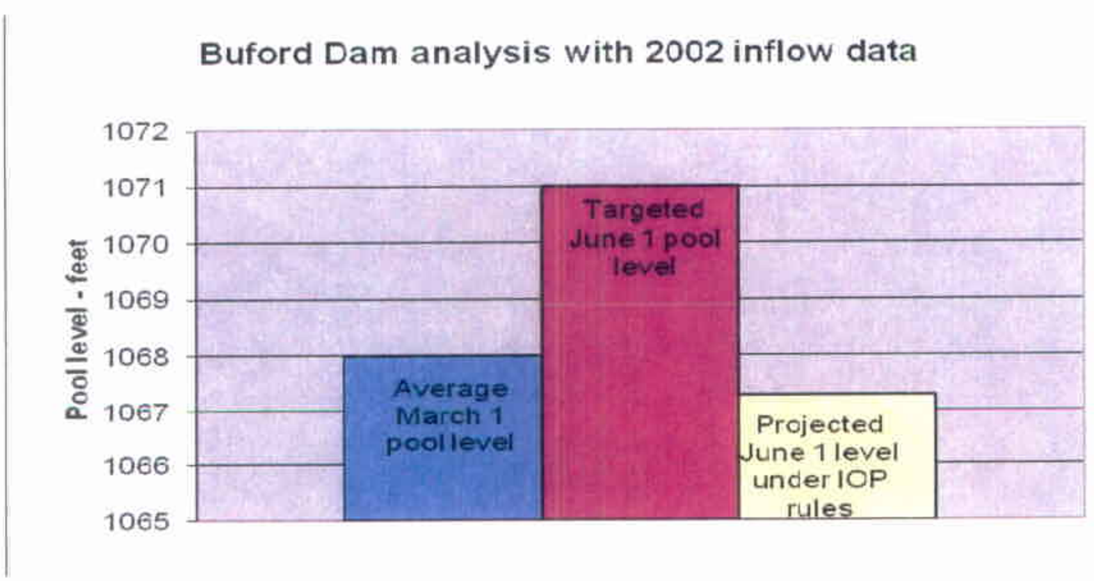

Figure 7

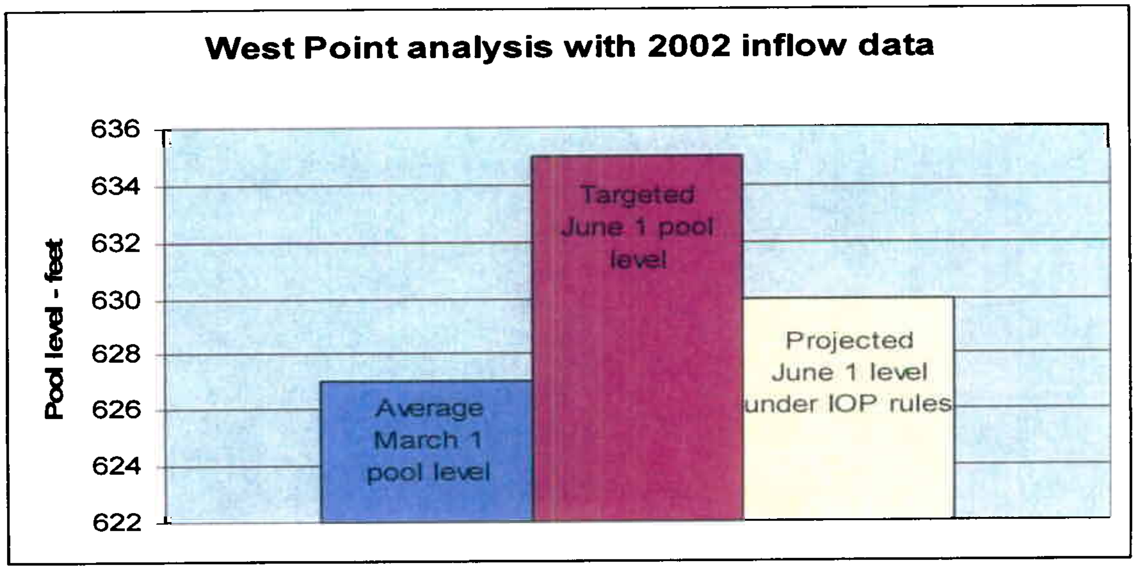

Figure 8

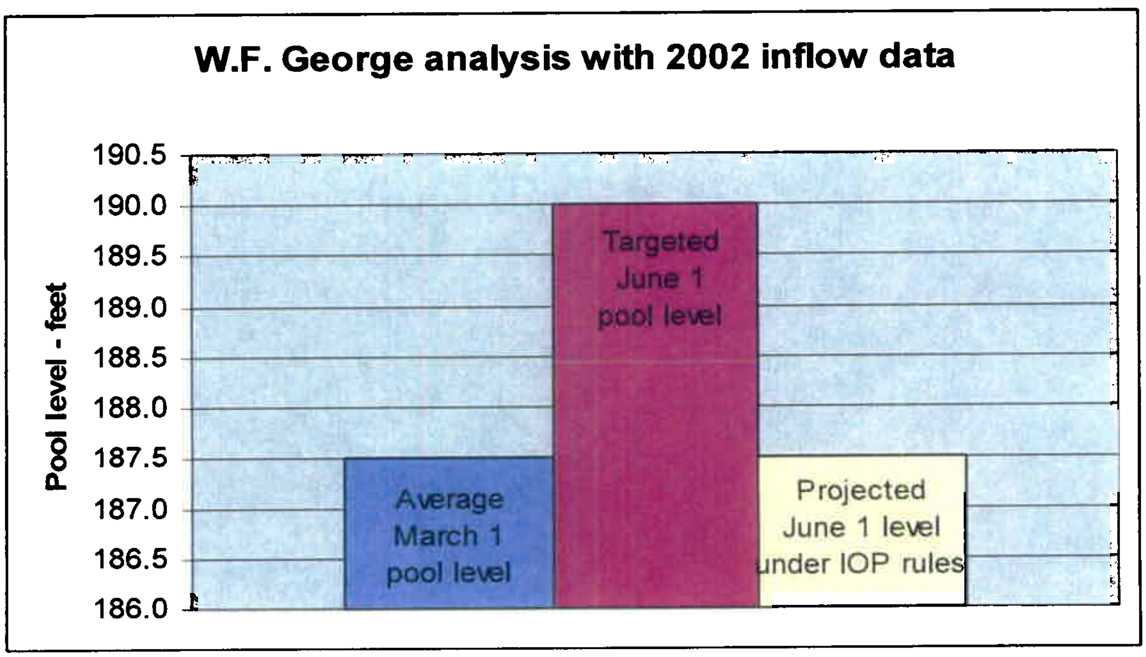

Figure 9

In 2004 there were only 12 days in early March when inflows were above the 18,000 cfs threshold. This would have allowed 60,102 dsf (under ideal conditions, assuming no flood control impacts) to have been stored, less than 30 percent of the total volume of water required to reach June 1 target levels, see Figure 10.

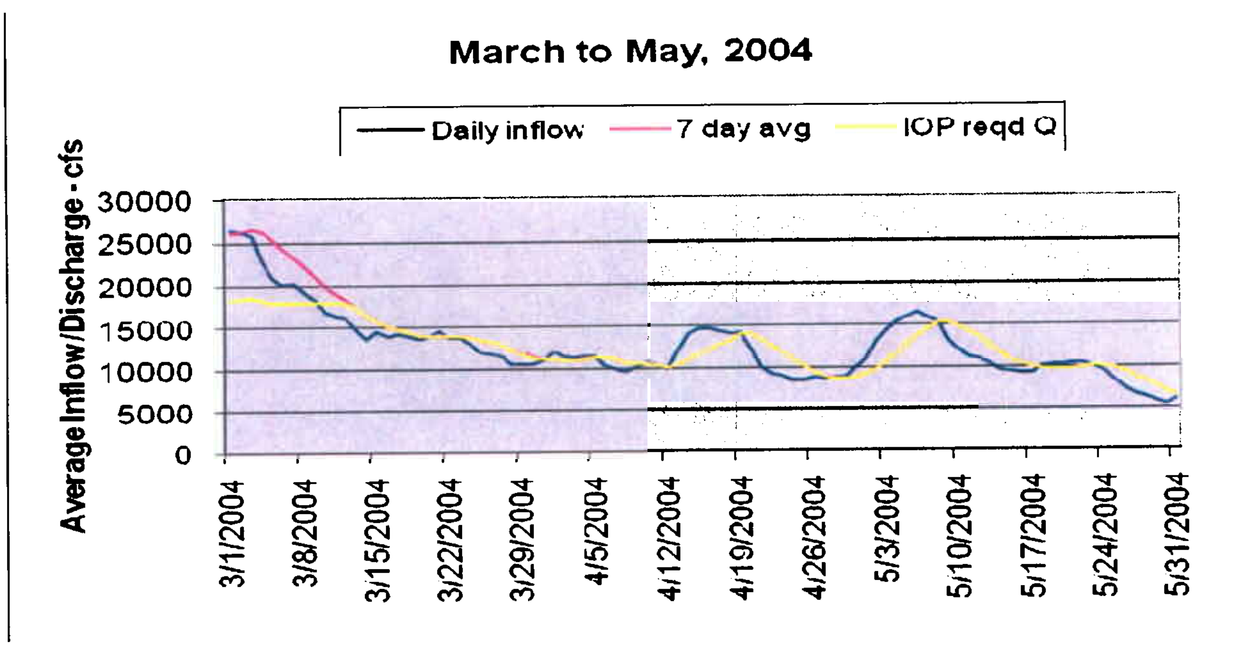

Figure 10

In the year 2000 there would have been 25 days that water could have been stored in the upstream projects. The amount available for storage would have been 133,240 dsf, less than 66 percent of the amount required to fill to June 1 target levels. Also, no water could have been stored after April 14; therefore W. F. George and West Point reservoirs would not have filled in the month of May, unless levels at Lake Lanier were lowered. Another short coming of the IOP would have also occurred in the year 2000. From April 5 to 11, according to the rules of the IOP, the releases from Jim Woodruff would have been above 18,000 cfs with a peak discharge of almost 22,500 cfs. It is hard to fathom how such a short term release could have provided meaningful environmental benefits while storing this additional water would have certainly provided other multi-purpose benefits later in the year, see Figure 11.

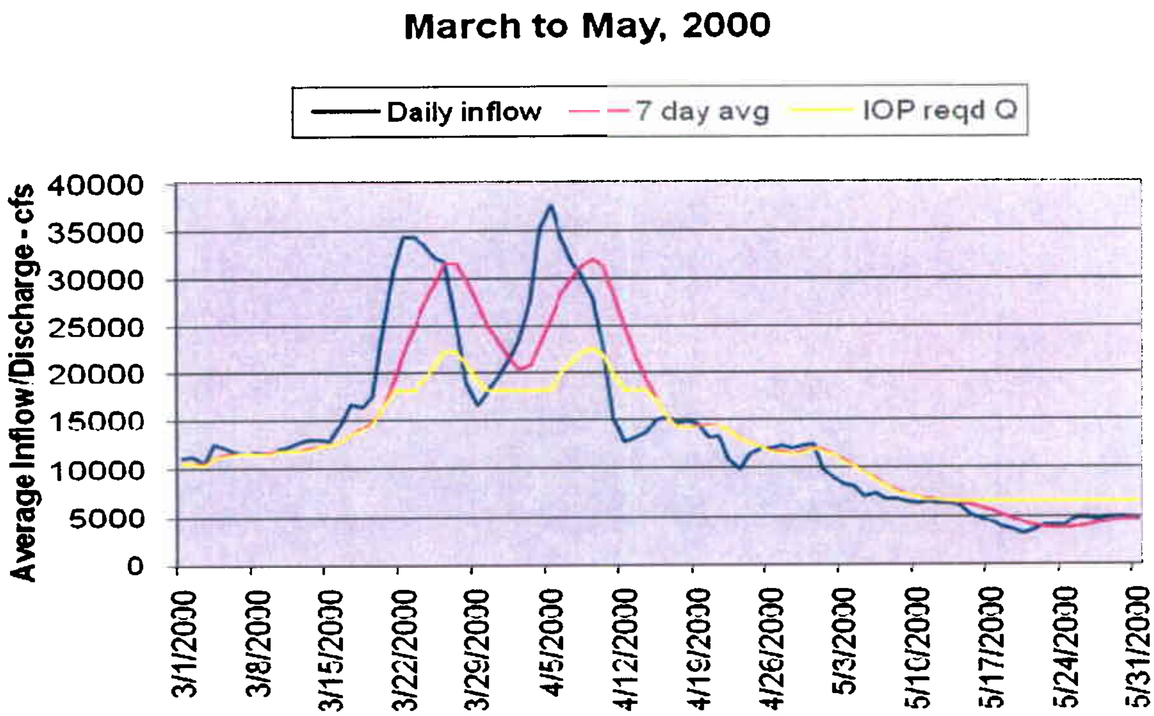

Figure 11

In 2001, pool levels could have been allowed to rise, but only until April 26, thereafter remaining fairly stable through the end of May. This again would result in Buford Dam pool levels being lowered in the month of May in an effort to raise West Point and W. F. George pool levels and balance the three storage projects.

2003 would have been an excellent year for operating under the IOP as there was plenty of water available up until the end of May.

In 2005, pool levels would have remained fairly stable after May 17.

In 2006, when the ACF basin was being operated under the IOP rules, there was essentially no water to store in the upstream projects after April 5 and the actual pool levels reflect this. From March 1 to May 31, 2006 Buford reservoir levels actually fell 2.1 feet, West Point reservoir level was raised only 0.75 foot and W. F. George pool level fell 1.59 feet.

In 2007 the same situation occurred, with March 21 essentially being the last day to store any water (there were 4 days in April with inflows above 18,000 cfs). The total amount of water available to store in 2007 was 104,306 dsf, with just over 3 percent of this water available after March 21. However, as shown in Figure 3, the volume of water actually released in 2007 was 81,100 dsf above what could have been stored, essentially wiping out the opportunity to store water and benefit other project purposes later in the year.

The operating rules under the IOP for June to the following February can also be restrictive at times. The years 1997 and 2001 are prime examples of these restrictions. In these years, there were potential opportunities to store water earlier in the summer and augment flows later in the drier months of August and September. However, the IOP rules could still force unnecessary releases. There was generally ample water in both these years and some of the water stored earlier in the summer could have certainly been used later to augment flows or provide extra hydro power, however the IOP forces the release of 16,000 cfs if the hydrologic inflows are sufficient, see Figures 12 and 13. It could be that high releases would be necessary during these times due to high pool levels, but if high releases are not mandated, then storing water for multi-purpose use would be the prudent water management decision.

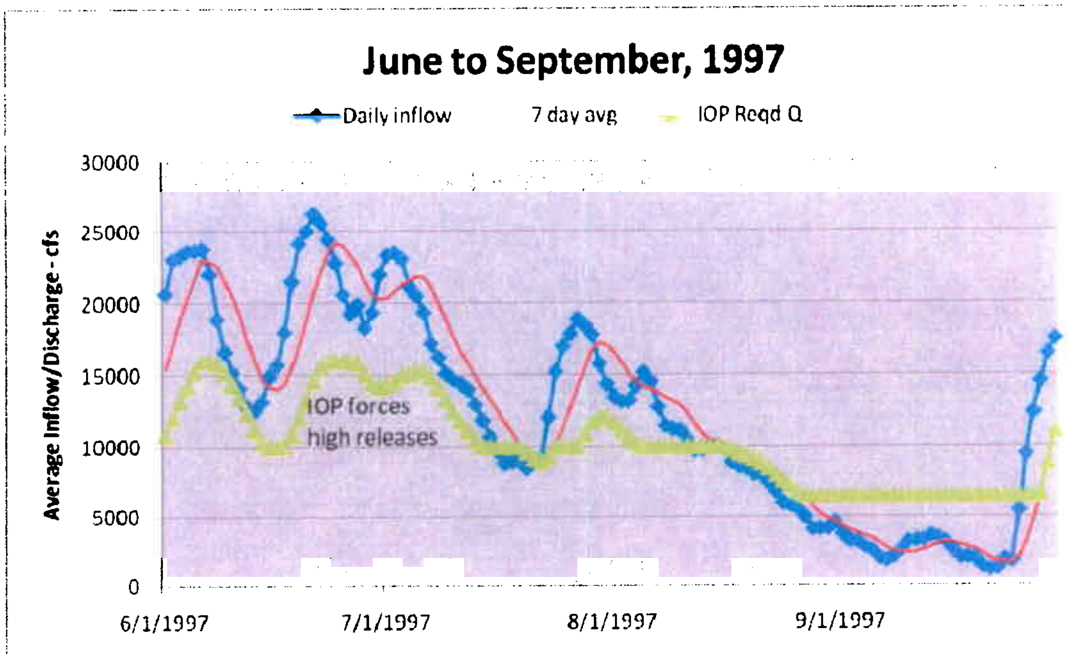

Figure 12

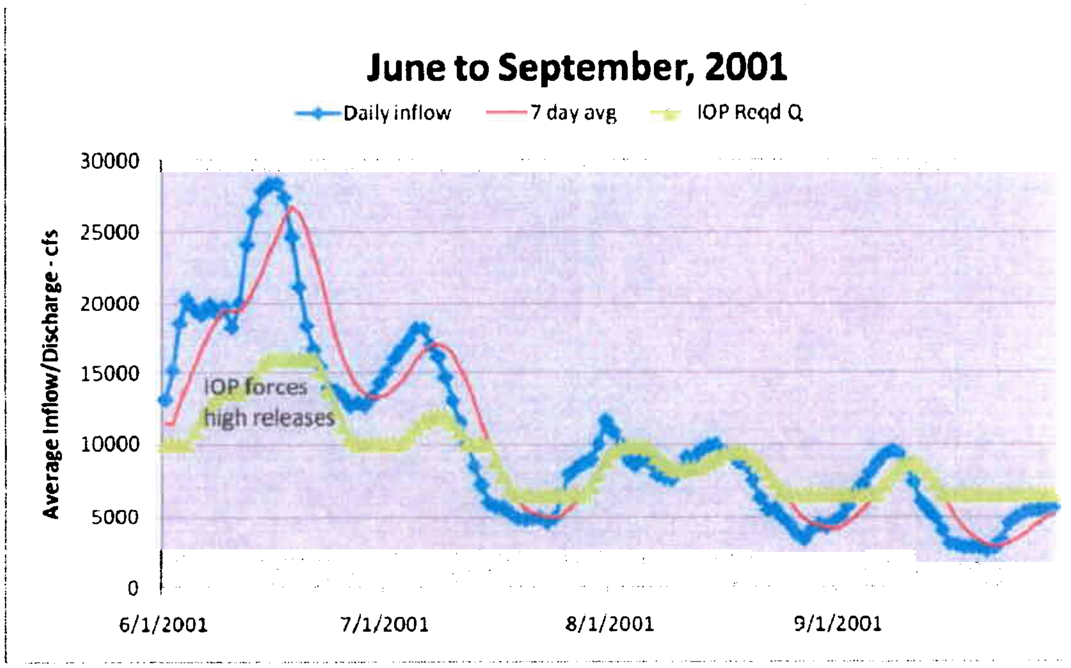

Figure 13

Water management of the ACF basin should allow for more storage under these circumstances for the water to be used later for water quality, water supply or hydropower generation considerations. Storing extra water earlier in the summer for later use also benefits recreation. Releasing 16,000 cfs for short periods of time cannot be very productive to sustained environmental flows and is counterproductive for supporting other multi-purpose objectives. Also, it was stated in the justification that a flow of 16,000 cfs is equivalent to the approximate average monthly flow levels for June to August, see page 4 of the Section 7 Consultation, Jim Woodruff Dam Water Management Operations, Adjustments to the Interim Operations Plan. However, in reviewing the average monthly hydrologic inflows for Jim Woodruff Dam, only two out of the last thirteen years were the average inflows for June to August greater than 16,000 cfs, see Figure 14.

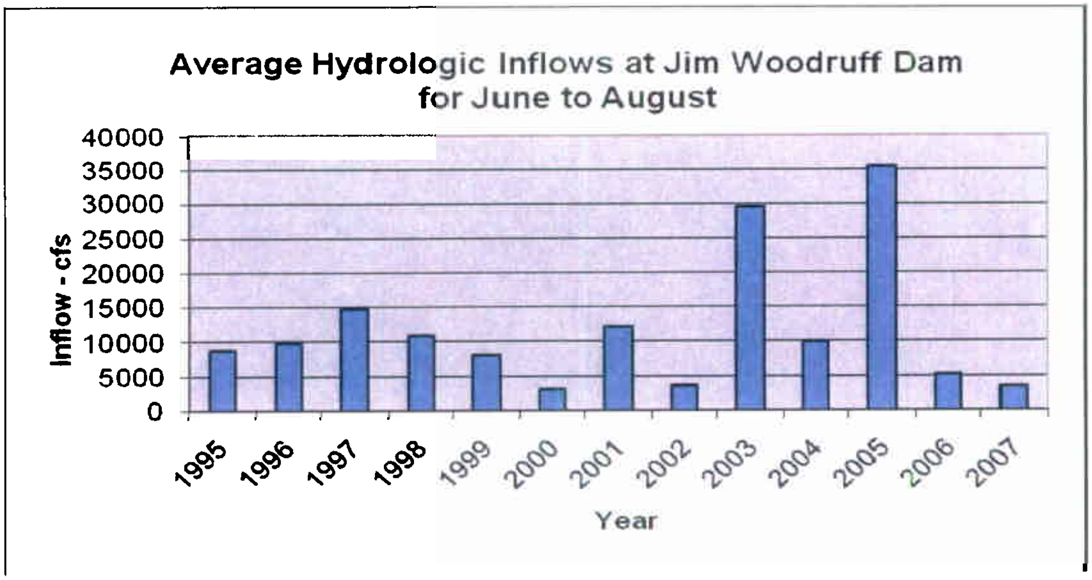

Figure 14

Comparing the IOP to the 1989 draft Water Control Manual

The most recent approved Water Control Plan for the ACF was completed in 1959. From 1989 to 2004, however, operations for the ACF were conducted in accordance with a 1989 draft Water Control Plan, with minor adjustments as necessary in some years to accommodate current needs at the time. The 1989 draft Water Control Plan was not finalized due to ongoing litigation. Following is a comparison of the draft 1989 Water Control Manual operating guidelines to the IOP for the March to May time period (for the years 1999 and 2002).

In 1999 the ACF basin was being operated by the draft 1989 Water Control Manual. From the March to May time period a total of 102,203 dsf of water was stored in the upstream projects, compared to only 61,998 dsf which would have been allowed under the IOP, see Figure 15.

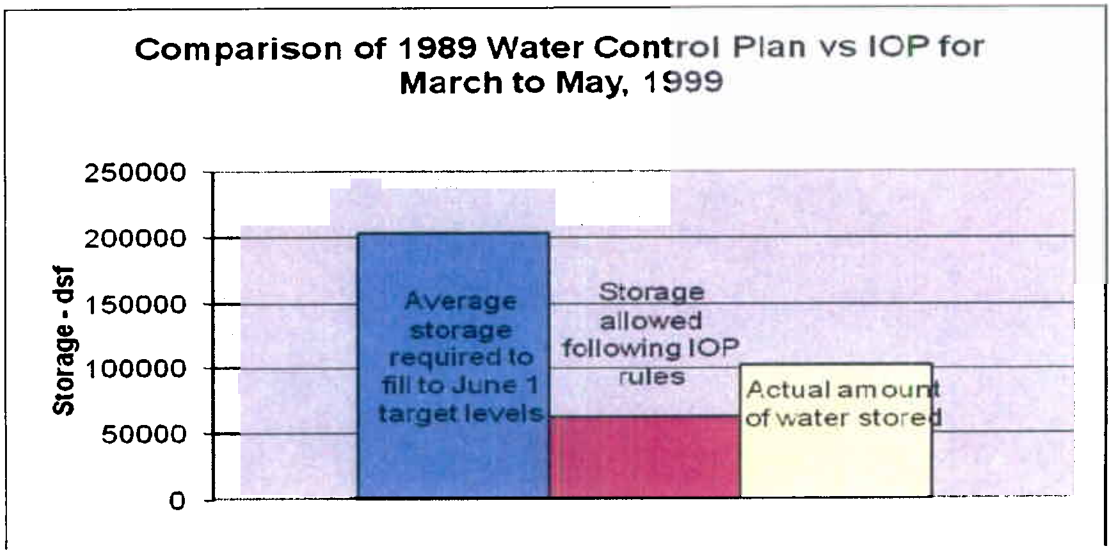

Figure 15

The year 2002 shows a dramatic difference between the two operational procedures. In 2002, the ACF basin was also being operated by the draft 1989 Water Control Manual and from the March to May time period a total of 139,369 dsf of water was stored in the upstream projects, compared to only 17,244 dsf which would have been allowed under the IOP, see Figure 16.

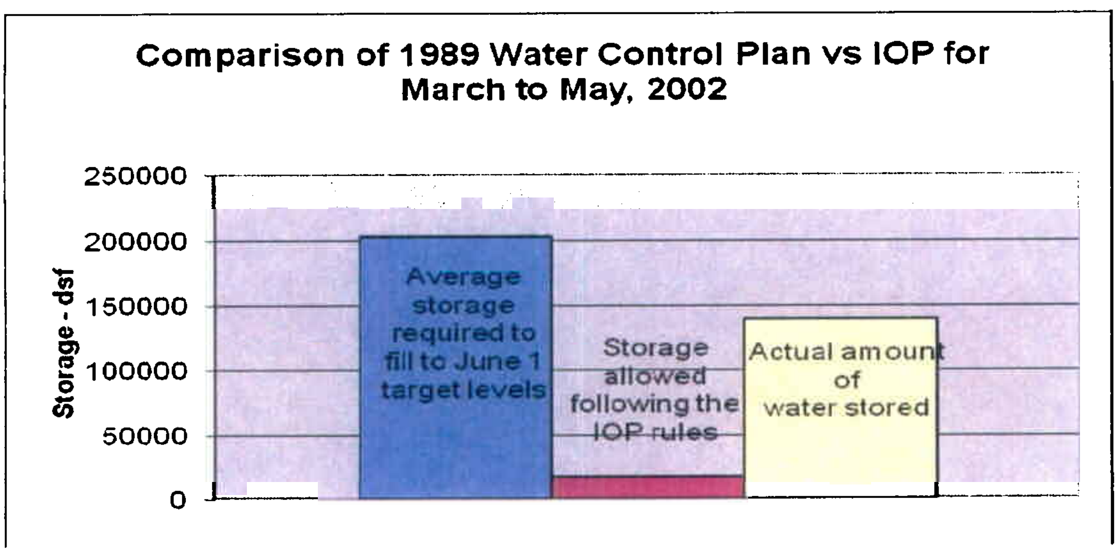

Figure 16

In 2004 and 2005 the ACF basin was operated under a "low flow operations protocols" and in 2006 and 2007 by the rules of the IOP. Following is a comparison of these four years of actual operation to the expected outcome from operations under the draft 1989 Water Control Manual.

From March to May of 2004, a total of 65,979 dsf of water was stored in the upstream storage projects; however the storage at Jim Woodruff Dam was decreased by 27,059 dsf during this period for a total net storage of 38,920 dsf. The low flow protocol operation is different than the guidelines set forth by the draft 1989 Water Control Manual. If the draft Water Control Manual guidelines were followed, a total of 75,300 dsf could have been stored in the upper storage projects without taking storage out of Jim Woodruff Dam, an increase of over 36,000 dsf. See Figure 17.

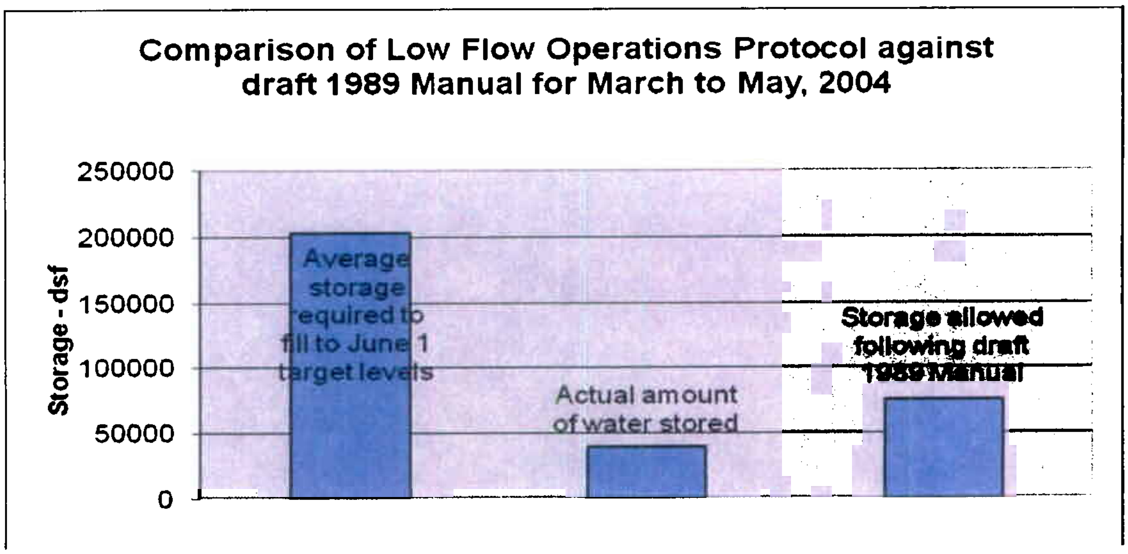

Figure 17

In 2005, hydrologic inflows were sufficient enough that all the storage projects were within 0.5 foot of the June 1 target level by the end of May. However, during May, the pool levels at Buford Dam were actually drawn down 0.5 foot to help fill the reservoir at West Point.

2006 was the first year the ACF basin began to operate under the IOP guidelines. Under the rules of the IOP, almost 267,000 dsf of water could have been stored from March to May in 2006. However, only 14,370 dsf was available for storage after March 31. Due to flood control issues, the storage projects actually were depleted by 1,554 dsf in the month of March 2006 and the total amount of actual water stored from March 1 to May 31 was a negative 64,599 dsf, see Figure 18. Pool levels at Buford Dam actually declined over 2 feet from March 1 to May 31 in 2006 and pool levels at W. F. George fell over 1.5 feet during the same time period. Under the draft 1989 Water Control Manual, the total amount of water available for storage would have been 590,497 dsf with 114,000 dsf available for storage after March 31.

In 2007 the opportunity existed to store 104,306 dsf of water under the IOP, however only 602 dsf were available for storage after March 15, 2007. The draft 1989 Water Control Manual would have made 240,426 dsf available for storage, with 20,700 dsf after March 15, 2007. The actual amount of water stored from March 1 to May 31 in 2007 was a negative 42,151 dsf, see Figure 18. The reservoir level at W. F. George actually fell 2.3 feet during this time.

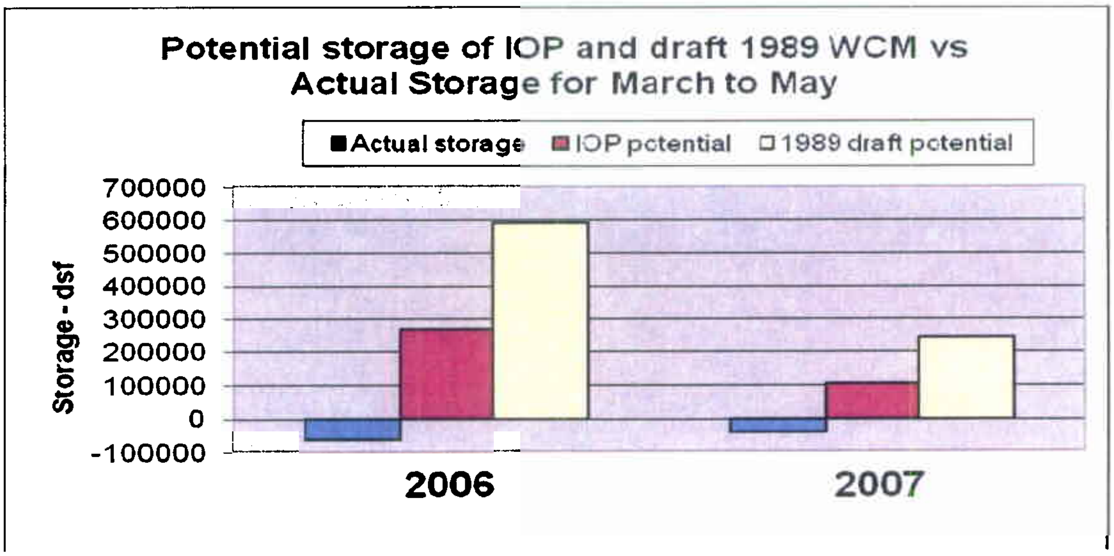

Figure 18

Evaluation of the Modification to the Interim Operations Plan at Jim Woodruff Dam

The MIOP includes a drought plan which would require a temporary waiver from the existing water control plan to provide for minimum releases less than 5,000 cfs from Jim Woodruff Dam when the appropriate triggers are met and would also include provisions to allow temporary storage above the winter pool rule curve at the Walter F. George and West Point projects if the opportunity presents itself and/or begin spring refill operations at an earlier date in order to provide additional conservation storage for future needs.

Like the current IOP, the MIOP specifies two parameters applicable to the daily releases from Jim Woodruff Dam: a minimum discharge and a maximum fall rate. The remaining portion of this report will focus on the minimum discharge requirements. The modifications do not change the basin inflow calculation (7-day moving average daily basin inflow), use of Chattahoochee gage to measure releases/river flow, use of volumetric balancing as described in the May 16, 2007 letter to the USFWS, nor the limited hydropower peaking operations at Jim Woodruff Dam.

Like the current IOP, the proposed MIOP varies minimum discharges from Jim Woodruff Dam by basin inflow and by month and the releases are measured as a daily average flow in cfs at the Chattahoochee gage. Table 1 shows the minimum release from Jim Woodruff Dam prescribed by the proposed action and shows when and how much basin inflow is available for increasing reservoir storage. Except when basin inflow is less than 5,000 cfs, the minimum releases are not required to exceed basin inflow. The current IOP defines three basin inflow threshold levels that vary by two seasons (spawning and non-spawning seasons). The proposed action defines additional basin inflow thresholds that vary by three seasons: spawning season (March to May); non-spawning season (June to November) and winter (December to February). The proposed action further modifies the current IOP by also incorporating composite storage thresholds that factor into minimum release decisions.

Table 1. Proposed Action Modified IOP Releases from Jim Woodruff Dam

Months	Composite Storage Zone	Basin Inflow (BI) (cfs)	JWLD Release	Basin Inflow Available for Storage[1]
March - May	Zones 1 and 2	>= 34,000	>= 25,000	Up to 100% BI > 25,000
		>=16,000 and <34,000	>=16,000 + 50% BI >16,000	Up to 50% BI > 16,000
		>=5,000 and <16,000	>=BI	
		<5,000	>=5,000	
	Zone 3	>=39,000	>= 25,000	Up to 100% BI > 25,000
		>=11,000 and <39,000	>=11,000 + 50% BI >11,000	Up to 50% BI > 11,000
		>=5,000 and <11,000	>=BI	
		<5,000	>=5,000	
June - November	Zones 1, 2 and 3	>=24,000	>=16,000	Up to 100% BI > 16,000
		>=8,000 and <24,000	>=8,000 + 50% BI >8,000	Up to 50% BI > 8,000
		>=5,000 and <8,000	>=BI	
		<5,000	>=5,000	
December -	Zones 1, 2 and 3	>=5,000	>=5,000 (Can store all BI	Up to 100% BI > 5,000

February			>5,000)	
		<5,000	>=5,000	
At all times	Zone 4	NA	>=5,000	Up to 100% BI > 5,000
At all times	Drought Zone	NA	>=4,500[2]	Up to 100% BI > 4,500

[1]Consistent with safety requirements, flood control purposes, and equipment capabilities

[2]Once composite storage falls below the top of the Drought Zone ramp down to 4,500 cfs will occur at a rate of 0.25 ft/day.

MODIFICATION HIGHLIGHTS

On the surface, the proposed MIOP appears to provide better opportunities to store water than those currently available with the IOP. For one, the modifications allow storing up to 50 percent of the inflow above certain thresholds compared to the 30 percent presently allowed. Certain threshold values have also been lowered. The current IOP called for releasing all basin inflow below 18,000 cfs between the months of March to May, while the modified plan sets the threshold at 16,000 cfs.

However, the current IOP keeps the release at 18,000 cfs until the basin inflow is 25,714 cfs. Under the modified IOP, if the basin inflow is 25,714 cfs the minimum release from Jim Woodruff Dam is 16,000 cfs plus 50 percent of the basin inflow above 16,000 cfs (as long as the composite storage is in Zones 1 or 2). This results in a required release of 20,857 cfs, or 2,857 cfs more than required under the current IOP.

See Table 2 below for a comparison of the minimum releases rates from the modified and current IOPs based on time of year, composite storage and basin inflow.

Table 2. Comparison of Minimum Releases

Time of Year	Composite Storage Zone	Basin Inflow (cfs)	Minimum Release Current IOP	Minimum Release Modified IOP
March to May	1, 2	50,000	25,000	25,000
March to May	1, 2	35,000	24,500	25,000
March to May	1, 2	25,000	18,000	20,500
March to May	1, 2	15,000	15,000	15,000
March to May	1, 2	5,000	6,500	5,000
March to May	1, 2	2,500	6,500	5,000
March to May	3	50,000	25,000	25,000
March to May	3	35,000	24,500	23,000
March to May	3	25,000	18,000	18,000
March to May	3	15,000	15,000	13,000
March to May	3	5,000	5,000	5,000
March to May	3	2,500	5,000	5,000
June to November	1, 2	25,000	16,000	16,000
June to November	1, 2	15,000	10,500	11,750

June to November	1, 2	10,000	10,000	9,000
June to November	1, 2	5,000	6,500	5,000
June to November	1, 2	2,500	6,500	5,000
June to November	3	25,000	16,000	16,000
June to November	3	15,000	10,500	11,750
June to November	3	10,000	10,000	9,000
June to November	3	5,000	5,000	5,000
Dec to February	1, 2	25,000	16,000	5,000
Dec to February	1, 2	10,000	10,000	5,000
Dec to February	3	25,000	16,000	5,000
Dec to February	3	10,000	10,000	5,000

Based on the comparison above, the MIOP and IOP appear to be very similar, except for the December to February time period.

Based on the comparison above the MIOP appears to allow more water to be stored in the ACF basin from December to February. In the current IOP, if the basin inflow is above 10,000 cfs, the required release was 70 percent of basin inflow, but not less than 10,000 cfs, while under the MIOP all basin inflow above 5,000 cfs can be stored. However, as seen during the 2007-2008 winter, when the EDO-required minimum was also 5,000 cfs, and storing water upstream was a primary operating strategy, the releases at Jim Woodruff Dam were only around 5,000 cfs until December 19th. Once inflows increased in the ACF basin and the two lower storage projects, West Point and W.F. George, were essentially full, releases at Jim Woodruff had to be increased to maintain flood storage capacity. Even with the ACF basin in full drought recovery mode and operating under the EDO, releases at Jim Woodruff Dam averaged over 13,000 cfs and 25,000 cfs for the months of January and February, respectively. This is largely due to the limited storage capacity downstream of Buford Dam and the lower pool levels required to maintain flood storage capacity. Thus, although the modification to the December to February time frame seems like an opportunity to store a significant amount of water, it really is not, unless the inflow is to Lake Lanier.

Shortcomings of the Modified IOP

As described previously in the IOP evaluation the years 1999, 2002, and 2004 are good examples of years in which the current IOP fails to store sufficient water to provide other multi-purpose benefits. Following is a comparison of the IOP and MIOP's ability to store water for future uses in those years.

From March to May in 1999, the current IOP would have allowed 61,998 dsf of water to be stored in the upstream projects. Under the modified IOP only 59,992 dsf of water could have been stored.

From March to May in 2002, the current IOP would have allowed 17,244 dsf of water to be stored in the upstream projects. Under the modified IOP 31,472 dsf of water could have been stored.

From March to May in 2004, the current IOP would have allowed 60,102 dsf of water to be stored in the upstream projects. Under the modified IOP only 43,690 dsf of water could have been stored.

Also, from March to May in 2007, 81,313 dsf of water could have been stored in the upstream projects under the IOP, while the MIOP would have allowed 93,355 dsf of water to have been stored.

See Figure 26 for a graphical representation of the current IOP to the modified IOP for these years.

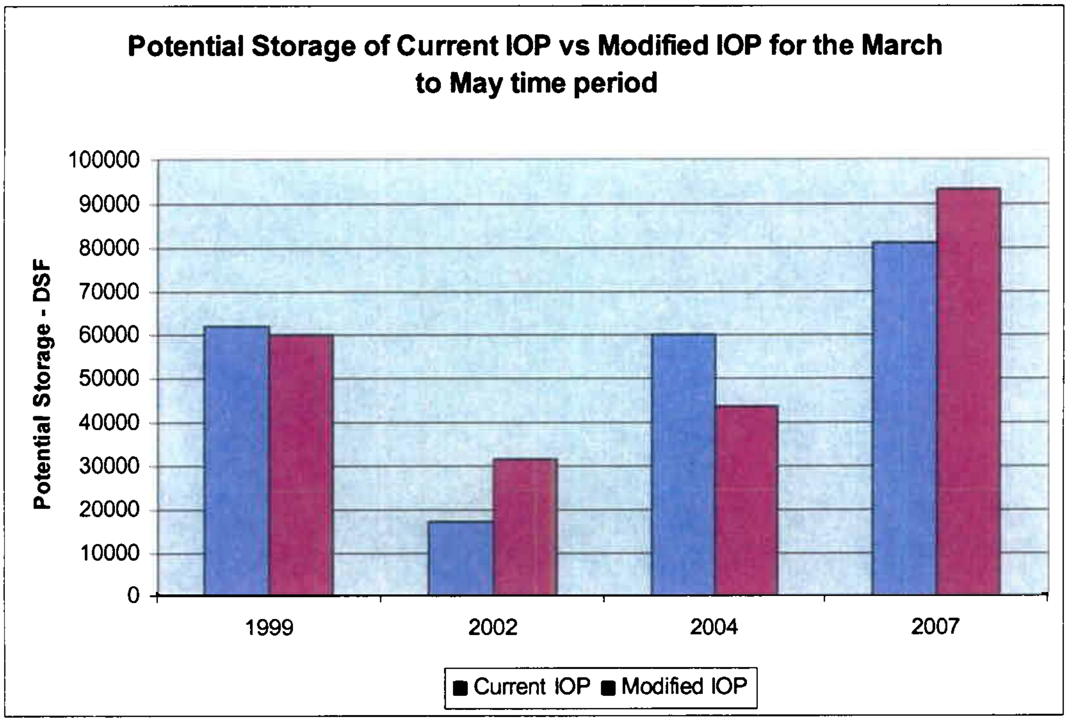

Figure 26

Based on the comparison of the discharges required and the March to May time periods of 1999, 2002, 2004 and 2007 there appears to be no significant difference between the MIOP and IOP. Thus, as shown, both the MIOP and IOP fail to maximize the multi-purpose benefits of the ACF projects.

However, the MIOP does incorporate some of the EDO operating rules. Under the MIOP, when composite storage falls below the bottom of Zone 3 into Zone 4 all previous operating rules are suspended and management decisions are based on the provisions of the drought plan. The drought plan allows temporary storage above the winter rule curve at Walter F. George and West Point projects if the opportunity presents itself and/or to begin spring fill operations at an earlier date. Also included is a provision to reduce the minimum discharge to as low as 4,500 cfs. This minimum discharge is instigated when composite storage is in the "drought zone". The drought zone is an additional zone in

Zone 4 which delineates a volume of water roughly equivalent to the inactive storage in lakes Lanier, West Point and Walter F. George plus Zone 4 storage in Lake Lanier. When composite storage is in the drought zone, the minimum release will be reduced to 4,500 cfs and remain at this rate until composite storage is once again in Zone 4 and above the drought zone. At this time the minimum release again becomes 5,000 cfs. The drought plan provisions remain in place until conditions improve such that composite storage reaches a level above the top of Zone 3 (i.e., within Zone 2).

SUMMARY OF MODIFICATIONS TO THE INTERIM OPERATIONS PLAN

In a press release concerning the MIOP, the USACE states "The modified IOP proposal includes provisions to store additional freshwater in the basin during the winter and during drought periods while minimizing harm to the four listed species, the threatened Gulf sturgeon and three mussels, the endangered fat threeridge, the threatened purple bankclimber, and the threatened Chipola slabshell. The additional storage is then available later for continued support of the species as well as other authorized project purposes."

What the USACE fails to mention is that the MIOP does not improve, and in some cases worsen, the very operations which place the ACF basin into drought mode, very much like the current IOP. If the year 2008, or any other year, turns out to be a relatively dry year, then the ACF basin will once again be placed in dire straits with regards of trying to provide the multi-purpose benefits to the stakeholders within the ACF basin. Although the modified IOP does incorporate the intentions of the EDO, neither the current IOP nor the MIOP are reasonable operating plans for the ACF basin. Similar to the current IOP, the modified IOP can worsen a drought situation in the ACF basin due to its inability to store water when the situation presents itself. During drier than normal conditions, the modified IOP will drain the ACF basin and the discharge will be reduced to 4,500 cfs as required by the "drought zone" requirement. This definitely does not benefit the endangered species or downstream water quality in the ACF basin.

Possible Solutions

The main problem with both the IOP and MIOP is the high minimum flow release rates specified in the March to May time period, which do not allow enough water to be stored in relatively dry years. This can severely impact the other multi-purpose benefits which should be provided by the storage reservoirs in the ACF basin. There are relatively simple ways to improve the current IOP and MIOP. For instance, one change would be to require the daily average release to be 1,000 cfs (or more) less (for basin inflows 16,000 cfs or less) than the basin inflow until the 5,000 cfs threshold is met. This would still allow some storing of water in the ACF basin while mimicking natural occurring flows in the basin. The IOP and MIOP need to be modified in a way which will allow the ACF storage projects to store more water. This is particularly true when basin inflows are below normal. The ability to store water during these challenging times would allow the ACF projects to provide more multi-purpose benefits during dry years.

The storage projects in the ACF were designed to "store" water in the wet months and release a greater amount than the natural occurring inflows in the dry months. Both the current IOP and MIOP hinder the basic operating philosophy intended for the ACF basin.

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PROFESSIONAL EXPERIENCE

AMEC Earth and Environmental, Nashville, Tennessee
Senior Water Resources Engineer *November 2007 – Present*

- Assisting with Digital Flood Insurance Rate Map (DFIRM) work and Flood Insurance Studies (FIS) for the States of Alabama and Kansas. This includes running various HEC-RAS models for Zone A and Zone AE flood studies.
- Marketing various business development opportunities in the water resources community.

Alabama Power Company, Birmingham, Alabama
Consultant *June 2007 – Present*

- Currently representing APC as an expert witness with regards to reservoir operational concerns on the Apalachicola-Chattahoochee-Flint river basin.
- Assisted with various reservoir management issues including current and ongoing drought situation.

Tennessee Valley Authority, Knoxville, Tennessee

Department Manager *Jan 1997 – April 2007*

- Managed a team of 20 engineers and technicians to develop the operating strategy for TVA's hydro fleet consisting of 3600 megawatt capacity.
  - Average annual hydro generation revenues approximately $750 million
  - Continuously exceeded generation targets
- Directed the day to day duties of a 24/7, 365 days a year operations staff.
  - Average annual flood reduction benefits over $200 million
  - Worked with navigation interests to improve the commercial shipping industry
- Consultant to TVA power generating assets and hydro maintenance organizations providing expertise decision making to maximize revenues and reduce costs.
- Worked with various organizations across a seven state region to ensure communications and information exchanges were up to date.
  - Provided flood level information to the general public and appropriate National Weather Service offices
  - Provided information as necessary to upper management and others throughout TVA to help support business decisions

- Provided numerous newspaper and television interviews

- Served as liaison to Information Systems support staff to improve computer modeling efforts and data collection processes.
- Developed numerous procedures and processes to ensure consistent results or products produced.
- Implemented process improvements to maximize the value of the TVA hydro fleet consisting of 29 generating plants with 109 units.
  - Lead effort to reduce condensing hydro units in 2006, lowering TVA's costs by about $100k per month
- As a developmental assignment, served as manager of Data System and Inspections group responsible for maintaining TVA extensive data collection network across a 40,200 square mile area.
  - Completed rain gage reduction effort, resulting in savings of approximately $75k per year

Lead Civil Engineer *Aug 1990 - Jan 1997*

Team leader for a group of engineers and technicians responsible for the development of operating plans to maximize the water resource available to serve multipurpose benefits.

- Served as main point of contact for all operating decisions with regards to the TVA reservoir system.
- Ensured various hydrologic computer models were run to determine most economic, risk aversive outcome.
- Prepared clear and concise reports on reservoir operations to communicate directly with upper management.

EDUCATION

University of Tennessee, Knoxville, Tennessee

- Master of Science - Environmental Engineering

University of Tennessee, Knoxville, Tennessee

- Bachelor of Science - Civil Engineering
  - Graduated with honors
  - Chi Epsilon honor society president during senior year

University of Vanderbilt, Nashville, Tennessee

- Owen Graduate School of Management, TVA Executive Development Program

LICENSE

- Professional Engineer's license, Tennessee

F

A CRITIQUE OF THE BIOLOGICAL OPINION AND AMENDED BIOLOGICAL OPINION

Prepared by
W. Mike Howell, Ph.D., Consultant
Professor of Biology *emeritus*

W. Mike Howell, Ph.D.
23 April 2008

I. THE PURPOSE OF THIS REVIEW

I was asked to review the U. S. Fish and Wildlife Service's (FWS) Biological Opinion (BO) and Amended Biological Opinion (Amended BO) relative to the potential effects that the U. S. Corps of Engineers' Interim Operating Plan (IOP) and Exceptional Drought Operations (EDO) could have on the flow volume of Apalachicola River and the resultant effects on the Critical Habitat and life history requirements of the federally-threatened Gulf sturgeon, *Acipenser oxyrinchus desotoi*.

II. SUMMARY OF EVALUATION

As an ichthyologist for over forty years, and former curator of fishes at Cornell University, I have used my knowledge of fish biology and research in this area to analyze FWS' BO and Amended BO. I have carefully read and analyzed FWS' administrative record, BO and literature cited as utilized in the final BO of September 5, 2006 (as revised on September 22, 2006) and its Amended BO of November 15, 2007. The following are my findings:

1. FWS has inadequately assessed and interpreted the scientific data underlying its BO relating to the effects of water discharges from JWLD on the Gulf sturgeon and its critical habitat.

2. There is no data in the BO, or in any of the cited published studies, indicating any negative effect of the Corps of Engineers IOP (or any pre-IOP discharges) on the Gulf sturgeon either during the sturgeon's spawning months during March-April-May or at any other time of the year. In fact, the findings of a population study done by two university professors from Florida (at the request of FWS) stated, *"Currently, the Apalachicola River population of Gulf sturgeon appears to be slowly increasing over levels observed in the 1980's and 1990's."* (Pine and Allen, 2005, Doc. No. 260, FWS AR, P. 4955-4956). Thus, the historical water discharges by the COE have not been shown to decrease the Gulf sturgeon population since the 1980's and early 1990's as the population numbers have actually increased during this period. In other words, there is no scientific justification for the increased spring flows mandated by the IOP.

3. FWS' BO is incorrect that flow rates equal to or greater than 20,400 cubic feet per second (cfs) in the Apalachicola River below JWLD are needed for successful spawning of the Gulf sturgeon. The existing record evidence shows that FWS' conclusion on this point is erroneous. For example, the study by Pine et al. (2006) showed FWS' assertion to be incorrect as they found successful spawning at flows of 12,700-22,400 cfs (mean = 15,836 cfs). (Pine et al. 2006, Doc. No. 262, FWS AR).

4. Flows of 20,400 cfs or higher, as proposed by FWS' BO, would likely be detrimental to sturgeon eggs by preventing their attachment to the limestone shelf substratum. Furthermore, the larvae, when they hatch, cannot swim for the first two days post-hatching. Swimless larvae would be swept away by such high river

flows. Lab studies on surrogate sturgeon species have determined that young larvae cannot maintain position or swim against such currents. It is my professional opinion that the data strongly indicate that flows equal to or higher than 20,400 cfs are detrimental to successful Gulf sturgeon reproduction. Furthermore, such flows in fact waste stored water behind JWLD making it unavailable to augment river flow during periods of extreme drought.

5. The Gulf sturgeon's life history requirements and Critical Habitat stability would be harmed by the flow regime as mandated by the FWS in its BO. This opinion is supported by scientific findings produced by FWS' own scientific consultants from the University of Florida and their reports during 2005 and 2006 (Pine and Allen, 2005 and Pine et al., 2006 as cited above).

6. Nothing in FWS' Amended BiOp indicates that there would be any threat to the Gulf sturgeon due to the low flow scenarios analyzed in the Amended BiOp.

III. IOP MINIMUM DISCHARGES FROM WOODRUFF DAM DURING THE GULF STURGEON SPAWNING SEASON

A table is presented in the Biological Opinion (p. 11) detailing the IOP minimum discharge from Woodruff Dam by month and by basin inflow (BI). FWS' BO designated the following discharges to be released by the Corps from March through May during the Gulf sturgeon's spawning season:

1. During March through May, when the Basin Inflow (BI) is equal to or greater than 37,400 cfs, the discharge from Woodruff Dam will not be less than 37, 400 cfs.

2. During March through May, when the BI is between 20,400 cfs and 37,400 cfs, the discharge from Woodruff Dam will not be less than 20, 400 cfs.

3. During March through May, when the BI is less than 20,400 cfs, the discharge from Woodruff Dam will be an amount equal to the BI.

FWS states: " *The IOP operations during March through May are intended to support Gulf sturgeon spawning activities.* " (BO, p. 9).

The discharges as outlined in the IOP from March through May are inordinately high and questionable based upon the meager facts known about sturgeon spawning and spawning sites in the Apalachicola River. FWS stated, *"The IOP operations during March through May are intended to support Gulf sturgeon spawning activities."* (BO, p. 9). The truth is, the threshold discharges of 37,400 cfs and 20,400 cfs were established because that was the range of flows during the few days when they found Gulf sturgeon eggs during 2005 (Pine and Allen, 2005). Their reasoning was invalidated in a later study by Pine *et al.* (2006), who collected Gulf sturgeon eggs on 12 specific 2-3 day periods when flows were between 12,700 cfs and 22,400 cfs.

FWS presented a graph (BO, Figure 3.6.1.4.C, p. 104) that shows the relationship between discharge (cfs) and *"area (acres) of hard substrate inundated to depths of 8.5 to 17.8 ft deep at the two known Gulf sturgeon spawning sites on the Apalachicola River (RM 105 and RM 99) at flows of 5,000 to 50,000 cfs, based on cross sections located closest to egg collections during 2005 and 2006."* (BO, p. 104).

The FWS graph referenced above (BO, Figure 3.6.1.4.C, p. 104) was studied in depth by Dr. Wei Zeng. His interpretation was presented at the December 13, 2006 workshop in Columbus, GA to discuss potential alterations of the IOP in response to RPM3 of the BO that the FWS issued on September 5, 2006 (FWS AR p. 10647). I have also studied the graph and concur with Dr. Zeng in his interpretation. The graph shows that as the flow in the Apalachicola River increases from 5,000 cfs to between 10,000 cfs and 11,000 cfs, and then levels off until the flow is in excess of 20,000 cfs, there is an increase in the cumulative amount of available habitat available at known Gulf sturgeon spawning sites. Less than four acres of habitat is gained as the flow increases from 20,000 cfs to about 23,000 cfs. After the flow exceeds around 23,000 cfs, the available habitat actually decreases. At flows of around 27,000 cfs to 38,000 cfs, the amount of available spawning habitat is less than the amount of habitat available when flows are in the range of 10,000-11,000 cfs. Thus, FWS' minimum flow thresholds of 37,400 cfs and 20,400 cfs (during March through May of spawning season) waste water that could be stored for other purposes and may even be detrimental to the Gulf sturgeon.

IV. THE REPORT TO FWS BY DRS. PINE AND ALLEN (2005) ENTITLED, "*ASSESSING THE IMPACT OF REDUCED SPAWNING HABITAT ON GULF STURGEON RECRUITMENT AND POPULATION VIABILITY IN THE APALACHICOLA BAY SYSTEM*" (FWS AR Doc 260)

During 2005, Dr. William E. Pine, III, of Mote Marine Laboratory, and Dr. Mike S. Allen, of the University of Florida, submitted to FWS a report dealing with the use of historical tagging data and population models to simulate how reductions in recruitment via altered spawning habitat could influence population viability of the Gulf sturgeon in the Apalachicola River, Florida. They reported the following:

1. "...decreasing recruitment success for the Gulf sturgeon in the Apalachicola River would have deleterious impacts on the population viability. Increased frequency of recruitment failure as related to alterations in minimum flows on either a 5 or 10-yer interval would lead to population declines for this threatened species." (Pine and Allen, 2005).

2. "The recovery criteria for this species state that in the short-term the population must be stable or trending upwards in 3 of 5 consecutive years and that the long-term goal should be a "self-sustaining" population where mean annual recruitment is equal to the mean natural mortality rate over a 12-year period." (Pine and Allen, 2005).

3. "Our simulations suggest that sturgeon populations will not meet these recovery goals within the Apalachicola River if recruitment declines due to

changes in flow regime." (Pine and Allen, 2005). (The latter part of this sentence shows that the authors are unsure that there will actually be declines due to flow changes).

The above was in the summary by Pine and Allen, 2005. However, the following statements were included from their report to FWS and contain vital information which weighs heavily on the thesis of their research. These statements should never have been omitted from a summary (abstract) of their work because many researchers never read the details, only the summary or abstract of the research. In the details, they stated:

1. *"Based on results from the closed population model estimates and CPUE trends for 1998, 1999 and 2004, it appears that the Gulf sturgeon population below the JWLD in the Apalachicola River has increased from around 100 individuals during the 1980's and early 1990's (Zehfuss et al. 1999) to about 300 individuals now (Figure 2)."* (cited from Pine and Allen, 2005, Doc No. 260, FWS AR, P. 4950; italics and underlining added for emphasis).

2. Drs. Pine and Allen, in first part of their Results Section entitled, "Objective 1: Evaluating population trends", stated: "*Since the end of the intensive sturgeon sampling in 1993, approximately 345 sturgeon were captured, primarily during directed sampling in 1998, 1999, and 2004 when 85, 131, and 116 fish were collected respectively. Population estimates for these three years from model M_t which allows time dependent capture probability, increased from 253 individuals in 1998 (SE=66), to 270 (SE=44) in 1999, and 355 (SE=80) in 2004."* (cited from Pine and Allen, 2005, Doc No. 260, FWS AR, P. 4947; italics and underlining added for emphasis).

3. Drs. Pine and Allen, in their section on Management Implications stated: "*Currently, the Apalachicola River population of Gulf sturgeon appears to be slowly increasing over levels observed in the 1980's and early 1990's. This trend should be interpreted cautiously as this population is highly dynamic and likely experiences decadal long oscillations in population size related to the frequency of large year-classes being produced and sustained within the population. Whether the frequency or magnitude of these oscillations are affected by anthropogenic disturbances such as historical overfishing or large-scale habitat alteration remains unclear (Sulak and Randall 2002), but this population does appear to be relatively stable over the last 20-years of monitoring.* (Cited from Pine and Allen, 2005, Doc. No. 260, FWS AR, P. 4955-4956; italics and underlining added for emphasis).

4. Drs. Pine and Allen, in their Conclusions, stated, "*Although it is encouraging that each of the two most well-studied Gulf sturgeon population (Apalachicola and Suwanee River systems) are either stable or are growing slowly (Pine et al. 2001), clearly sturgeon populations are likely highly sensitive to changes in recruitment. Even subtle changes in recruitment patterns or early life survival may have large impacts on population viability (Pine et al. 2001) and sturgeon life history attributes do not lend them to be a species that can rapidly*

rebound in population size (Zehfuss et al. 1999, Zehfuss 2000, Pine et al. 2001, Sulak and Randall 2000)." (Cited from Pine and Allen, 2005, Doc. No. 260, FWS AR, P. 4959).

In short, Pine and Allen's study shows that the historical water discharges by the COE have not decreased the Gulf sturgeon population since the 1980's and early 1990's as the population numbers have actually increased during this period. In other words, Pine and Allen's study supports the conclusion that there is no scientific justification for the increased spring flows mandated by the IOP.

V. THE STATUS OF THE GULF STURGEON POPULATION IN THE APALACHICOLA RIVER

As stated above, during 2005, Drs. William E. Pine, and Mike S. Allen, submitted to FWS a report entitled, *Assessing the impact of reduced spawning habitat on Gulf sturgeon recruitment and population viability in the Apalachicola Bay system* (Doc. No 260, Pine and Allen, 2005).

The following year, Pine et al. (2006) prepared another report for FWS entitled, *An assessment of Gulf sturgeon movement, spawning site selection, and post-spawn holding areas in the Apalachicola River, Florida* (Doc. No. 262, Pine et al. 2006). The latter study was divided into two tasks: Task 1. Assessing Gulf sturgeon movement and spawning patterns in the Apalachicola River. Here, telemetered Gulf sturgeon were tracked from the bays, distributaries and tributaries to two spawning sites located below JWLD; This first task also included assessing spawning habitat availability and egg collections; and, Task 2. Determining population size estimate in the Brothers River habitats (Doc. No. 262, Pine et al. 2006).

In order to fulfill these tasks, Pine et al 2006 utilized the following: (1) telemetry of radio-tagged adults to determine seasonal and pre-spawning movements, and to track them to their spawning sites; (2) Use of fibrous, circular floor-cleaner pads attached to the river bottom in order to passively collect unattached and drifting eggs. This was to determine when and where a spawning act had taken place; and, (3) Use of mark and recapture techniques in order to estimate the numbers of Gulf sturgeon inhabiting Brothers River.

The pertinent findings of these researchers were as follows:

1. Verification of Gulf sturgeon spawning at 2 sites below JWLD. In a critique of these findings, Dr. Doug Peterson, a professor at the University of Georgia, used egg collection data from this study and used McKenzie's occupancy model to determine the probability that the researchers could detect individual spawning events due to the limitations of their sampling gear and experimental design (FWS AR, Doc. 94). Dr. Peterson's analysis showed that the researchers were only able to detect 2-10% of the total spawning events that occurred in 2006. This suggested that spawning was likely occurring at other sites as well as these two sites.

2. Examination of egg collection mats suggested that spawning occurred between April 3 and May 1. However, the actual spawning dates cannot be verified because the egg collection mats were only checked every 48-72 hours and detection probabilities were low (<10%).

3. Spawning occurred at water temperatures of 20-25° C.

4. Spawning occurred on 12 specific 2-3 day periods.

5. Spawning occurred during discharges from JWLD of 12,700 to 22,400 cfs (mean discharge during sampling periods was 15,836 cfs). These successful Gulf sturgeon spawnings during much lower river flows than those recommended in the BO refute FWS' assumption that higher flows are required for successful reproduction.

6. A judgment that it would take at least 5-10 consecutive years of intensive study in order to determine an optimal flow regime for Gulf sturgeon spawning in the Apalachicola River. I agree with these authors on their estimation of 5 to 10 consecutive years of study in order to determine the best flow regime. This would give adequate data as compared to the one year of data (2005) on which FWS based their recommendations.

Pine et al. (2006) tried to correlate spawning (egg collections) with increases in river discharge from JWLD. They stated: *"Additionally, spawning events were possibly related to increases in river discharge (Figure 14). For example, 80% of eggs were collected on April 7, 12-14, and April 28-May 1 following increases in river discharge from JWLD on April 6, 11, and 27-28."* (Pine et al., 2006, p. 18, paragraph 3).

As noted in the findings above, the egg collection pads were attached ("fished") to the limestone substrate at the spawning sites continuously for 2-3 days before they were checked. However, the researchers did not know the exact days on which spawning actually occurred. Although the river flow had been increasing in the days just before several (but not all) of these sampling events, discharge was actually declining when the egg collection pads were "fished" (*i.e.*, actually in the water and available to collect eggs) but not checked on 5 of the 11 sampling periods when a spawning event was detected. (Peterson, FWS AR, Doc. 94).

These researchers did not obtain a reliable indication of reproductive success for a reason they did not mention. According to the BO, sturgeon eggs hatch within 2 days. These researchers would miss many eggs on their egg collection pads because they would hatch and the swimless larvae would be swept away from the egg collection pad by the river currents. The egg membranes would then be eaten by snails and macroinvertebrates. This would invalidate any data presented on reproductive success. The researchers should have used very fine mesh larval nets to trap drifting larvae so that they could get data on the number of larvae produced per cubic meter of water sampled. The study by Pine et al. (2006) shows only that Gulf sturgeon spawned at two locations and times. It gives no data relative to the success of the spawn, nor does it document whether the spawning was affected by any rate of water discharge from JWLD.

VI. SIGNIFICANT POINTS FOR CONSIDERATION RELATIVE TO RIVER FLOW AND STURGEON LIFE HISTORY

1. USFWS admits to having no evidence linking flow and sturgeon migration. On page 72 of Biological Opinion FWS stated: *"Gulf sturgeon migratory movements within and into/out of the Apalachicola River may be influenced by flow; however, we have no direct evidence that either extreme high-flow events or extreme low-flow events preclude migration." (italics added for emphasis)*

2. USFWS admits to having no data relative to effect of flows above or below that which cause adverse effects to eggs, larvae or young-of-the-year sturgeon. On page 72 of Biological Opinion FWS stated: *"Flow may effect [sic?] habitat availability or suitability for young-of-the-year (YOY) fish in the river; however, we have no data that would describe the relationship or a threshold flow below or above which adverse effects may occur. High flow could conceivably wash away eggs, larvae, and YOY of limited mobility… ". (italics added for emphasis)*

3. USFWS admits that they cannot describe spawning habitat availability over a range of flows as a function of velocity, depth, and substrate. On page 71 of Biological Opinion FWS stated: *"A hydraulic simulation capability for the sturgeon spawning is not available to the Service at present to describe spawning habitat availability of a range of flows as a function of velocity, depth, and substrate. At this time, we must use depth and substrate only for that purpose." (italics added for emphasis).*

VII. FWS DOES NOT FULLY UNDERSTAND THE EFFECTS OF RIVERINE FLOW ON THE GULF STURGEON

A detailed reading of FWS' BO demonstrates conclusively that there is a lack of understanding of the role of river flow, if any, in the biology of the Gulf sturgeon. The following examples illustrate this fact:

FWS states, "*River flow <u>may</u> serve as an environmental cue that governs both sturgeon migration and spawning (Chapman and Carr 1995; Ross et al. 2001b). If the flow rate is too high, sturgeon in several life-history stages can be adversely affected. Data describing the sturgeon's swimming ability in the Suwanee River strongly <u>indicates</u> that they cannot continually swim against prevailing currents of greater than 1 to 2 m per second (3.2 to 6.6 ft per second) (K. Sulak, USGS, pers. Comm.. cited in Wakeford 2001). If the flow is too strong, eggs <u>might not be able</u> to settle on and adhere to suitable substrate (Wooley and Crateau 1985). Flows that are too low can cause clumping of eggs, which leads to increased mortality from asphyxiation and fungal infection (Wooley* *and Crateau 1985). Flow velocity requirements for YOY sturgeon may vary depending upon substrate type."* (Cited under section 2.1.3.3. Freshwater Habitat, p. 20). (underlining added for emphasis).

In the paragraph above, and in several other places in the BO, FWS attempts to interject a role for river flow that is undocumented by scientific data. Their statement "*River flow may serve as an environmental cue that governs both sturgeon migration and spawning...*" is a guess. Fish biologists and ichthyologists have for years known that migrations and spawnings are regulated almost exclusively by two factors: the photoperiod and water temperature. It is the increasing daylight (day length) relative to that of darkness (night length) and increasing water temperatures during the transition from winter into spring (and early summer) that initiates migrations and spawning of over 90% of our freshwater species in Alabama (see Table 1). For example, applying FWS' assumptions, during an exceptionally dry spring when river flows are significantly below the norm, what do freshwater fishes do? Do they fail to spawn? Certainly not, as already shown by Pine et al. 2006. They migrate (if they are migratory) and they continue to spawn as always. Otherwise, a whole generation of a fish species would be lost for a whole river system in one dry spring (this would be devastating to a species that lived for only one to two years as most of our minnows and darters). The point to be made here is that river flow is a variable environmental parameter, subject to the extremes of flooding and drought. Increasing daylight (associated with increasing day length) is a non-variable environmental parameter at a given geographical point, such as Woodruff Dam. The most astute astronomers (and even the lowliest of farmers) know and depend on the non-variability of this fact. Interaction of increasing daylight with the pineal eye of fishes is a strong cue to initiate spawning in almost all species of temperate freshwater fishes. Increasing water temperatures as the season moves from winter into spring (and early summer) is also a non-variable environmental parameter in areas of the world that experience definitive seasons (such as in Alabama, Georgia, Florida).

Indeed, FWS' BO makes clear that additional information is needed to understand the role of river flow on sturgeon biology:

> *"Data concerning the temperature, oxygen, and current velocity requirements of cultured sturgeon are being collected. Researchers plan to use information gained from these laboratory experiments on hatchery-reared sturgeon to develop detailed information on water flow requirements of wild sturgeon throughout different phases of their freshwater residence (Wakeford 2001)."* (Cited under section 2.1.3.3 Freshwater Habitat, p. 21).

It is scientifically unsound to use information from a laboratory setting to "develop detailed information on water flow requirements of wild sturgeon." A minnow, *Rhinichthys cataractae* can be caught in the wild and brought into the laboratory. In an aquarium with non-moving water and a sand bottom, it will spawn at a given artificial light regime and water temperature. However, this laboratory-gathered information would be useless to extrapolate into the actual field because of the innate behavior of this species. In nature, this minnow lives in swift water and spawns its eggs over gravel and rubble, not sand.

VIII. DOES WATER FLOW HAVE ANYTHING TO DO WITH SPAWNING MIGRATIONS?

FWS presents no scientific data that show that water flow during the spring months actually induce or stimulate Gulf sturgeon spawning migrations. They stated:

> *"Migratory behavior of the Gulf sturgeon seems influenced by sex, reproductive status, water temperature, and possibly river flow."* (cited from BO 2.1.3.5 Migration section, p. 22) . (italics and underlined added for emphasis).

Much further into their report, FWS admits that there is no evidence linking Gulf sturgeon migration to river flow. They stated:

> *"Gulf sturgeon migratory movements within and into/out of the Apalachicola River may be influenced by flow; however, we have not direct evidence that either high-flow events or extreme low-flow events preclude migration."* (cited from BO 3.6.1.4 Flow regime section, p. 72). (italics added for emphasis).

In spite of the statement above, FWS further contradict themselves by stating that the fall migration appears to be initiated by pulses of higher river discharge. They stated:

> *"Downstream migration from fresh to saltwater begins in September (at about $23^0C[73^0F]$) and continues through November (Huff 1975; Wooley and Crateau 1985; Foster and Clugston 1997). During the fall migration from fresh to saltwater, Gulf sturgeon may require a period of physiological acclimation to changing salinity levels, referred to as osmoregulation or staging (Wooley and Crateau 1985). This period may be short (Fox et al., 2002) as sturgeon develop an active mechanism for osmoregulation and ion balance by age 1 (Altinok et al. 1998). On some river systems, timing of the fall migration appears to be associated with pulses of higher river discharge (Heise et al. 1999a and b; Ross et al. 2000 and 2001b; Parauka et al. 2001)."* (Cited under section 2.1.3.5 from BO Migration p. 22). (italics and underlined added for emphasis).

FWS also stated that not all Gulf sturgeon migrate upstream during spawning season. They stated:

> *"In the spring (March to May), most adult and subadult Gulf sturgeon return to their natal river, where sexually mature sturgeon spawn, and then stay until October or November (6 to 8 months) in freshwater (Odenkirk 1991; Foster 1993; Clugston et al. 1995; Fox et al. 2000). Fox et al (2000) found that some individuals in the Choctawhatchee River subpopulation do not enter the river until the summer months." (cited from 2.1.3.5 Migration, p. 22). (italics and underlining added for emphasis).*

If increased water flows during the spring serve as a cue to begin their upstream spawning migrations, then why do some individuals in the Choctawhatchee River fail to migrate and wait until the summer months when water flows are at their lowest? This behavior is in direct contradiction to FWS' hypothesis that increased water flows stimulate upstream migration. It is also contrary to the fact that migratory spawning activities are regulated by increasing day length and water temperatures. Why these individuals should remain behind is an enigma.

M.T. Randall and K.J. Sulak's paper entitled, "Relationship between Recruitment of Gulf Sturgeon and Water Flow in the Suwanee River, Florida" (2007), suggests that there may be a "second minor period of spawning . . . in the fall, during September and October." (Randall & Sulak 2007, Introduction, lines 17-19). Additionally, the initial hypothesis of Randall and Sulak was that Gulf sturgeon recruitment would be linked to high spring flows. Unexpectedly, these authors found that strong year-classes correlated, instead, with years of high water flows during the fall months of September and/or December. Nowhere in either the Biological Opinion or Amended Biological Opinion does the FWS discuss the possibility of a second fall spawning or the possible importance of fall/winter flows.

The possibility of a second fall spawning period is related to another issue unaddressed by FWS in either the Biological Opinion or Amended Biological Opinion. A 1985 report prepared by Wooley & Crateau describes that during the fall, 15 of 17 radio-tagged fish migrated downstream from Jim Walter Lock and Dam over a 40-day period (October-November) as the water temperature in the late fall dropped to 18 degrees C. All 15 fish during mid to late November entered either Apalachicola Bay or the Gulf of Mexico. The authors stated, "The two largest sturgeon overwintered below JWLD, demonstrating the capability for extended freshwater residency." (Wooley & Crateau 1985, Abstract, lines 14-15). Wooley & Crateau (1985) further explain that "[b]y early November, only the two largest sturgeon (38 kg) radio-tagged in 1983 remained in the summer dormant area below JWLD. These fish were captured in early May 1983 in the upper Apalachicola River at a water temperature of 20-21 C. It is not known how long these fish had been in freshwater or if they had spawned during this period. At the time of tagging, sex could not be determined. Both fish spent the entire summer in this area." (Wooley & Crateau 1985, 598-599). The 2 specimens out of 17 represent nearly 12% of this group that did not migrate downstream. As noted earlier, FWS also acknowledges that not all Gulf sturgeon migrate upstream during spring spawning season but wait until the summer months. Additionally, nonmigrating sturgeon are further evidence that high flow is not a trigger for spawning, as mentioned previously in this report. (Heise 1999b)

Nowhere in the Biological Opinion or Amended Biological Opinion is there any discussion of the possible overwintering of gulf sturgeon below JWLD. It would be particularly relevant to know if overwintering Gulf sturgeon participate in the fall spawn mentioned by Randall and Sulak. It is my professional judgment that FWS' failure to address the potential for fall spawning and overwintering below JWLD is a significant omission from the Biological Opinion and Amended Biological Opinion. FWS may have overestimated the importance of the spring spawning period to the detriment of the Gulf sturgeon's summer and fall behavior.

IX. DOWNSTREAM MIGRATION IN THE FALL

FWS stated that upstream migration to spawning sites occurred during early spring. Gulf sturgeon spawn in their natal river mostly during April. They then remain there for three to four months until October to November during which time they begin their downstream fall migration as they head for their wintertime feeding grounds in the brackish and saltwater in the bays, estuaries and Gulf of Mexico.

FWS makes the assumption that high water flows during spring months serve as cues to upstream spawning migrations. Conversely, they state above that on some river systems, the same high water cues during the fall months (September through November) serve to initiate downstream migrations. How and why *high water flows can initiate both upstream and downstream migrations* were not addressed by FWS. (cited in paragraphs above). FWS acknowledges the role of water temperature as an environmental cue to migration, when FWS states, *"Downstream migration from fresh to saltwater begins in September (at about 23^0C[73^0F]) . . . ."*

X. A COMPARATIVE STUDY ON SPAWNING TIMES OF ALABAMA FISHES

In the BO, FWS suggests that river flow, especially high river flow during the spring of the year, is crucial to the recovery of the Gulf sturgeon below Woodruff Dam. FWS states that increased river flow was the stimulus that initiated both spring and fall migrations. I have made the point that it is factual that both increasing water temperature and/or day length are the primary environmental cues that initiate spawning in over 90% of our species in the southeastern United States. The same would be true in Alabama, Georgia or Florida. Indeed, 92.7% of 261 species of Alabama fishes spawn at some time during either March, April and/or May, overlapping their spawning times with that of the Gulf sturgeon (comparative spawning data were compiled from the following source: *Fishes of Alabama and the Mobile Basin, by M. F. Mettee, P. E. O'Neil and J. Malcolm Pierson.* 1996. Oxmoor Press, Birmingham, AL, 820 pages).

It is increasing water temperature and increasing day length rather than high water flow during early spring that stimulates many of the species that spawn during March, April and/or May to shed their eggs or sperm. Obviously, several fish species live in spring basins, lakes and headwaters that do not experience high flows during spring, but also spawn during the same months as the Gulf sturgeon (e.g. Lake sturgeon, pygmy sunfishes, some sculpins, Coldwater darter, Watercress darter, etc.).

XI. IN ORDER TO JUSTIFY A HIGH RIVER FLOW, FWS DOES NOT ATTEMPT TO DUPLICATE THOSE RIVER FLOW CONDITIONS OF THE MOST SUCCESSFUL GULF STURGEON POPULATION, THAT OF THE NEARBY SUWANEE RIVER

A comparison of river size and water flow in the Apalachicola and Suwanee Rivers shows that the Suwanee is a much smaller river with much less water flow. Yet, the Suwanee River contains by far the largest population of Gulf sturgeon. Clugston et al., 1995 studied population dynamics on the Suwanee River, Florida and stated "...the average annual flow is about 305 m^3/sec (Livingston et al. 1974)." Wooley and Crateau (1985) studied the sturgeon population on the Apalachicola River and stated that the river, "...has an average flow rate of 664.4 m^3/sec (Livingston, et al. 1974)... ." They further stated, "Minimum and maximum discharges over the past 15 years were 178 m^3/sec and 4,598 m^3/sec, respectively. The maximum flow on record of 8,292 m^3/sec (U. S. Study Commission 1963) was recorded in March 1929." It would appear that FWS would be trying to match the Suwanee River flow rate as closely as possible. Certainly an increase in flow rate is not in the best interest of the Apalachicola sturgeon if the flow rates in the Suwanee River are any indication of optimal conditions.

Carr et al. (1996) studied the Gulf sturgeon population in the Suwanee River, located just southeast of the Apalachicola River. They studied population size (numbers of specimens), seasonal migratory patterns, etc. During a nine years study (1986-1994), they collected 3,098 Gulf sturgeon and tagged and released 1,957 specimens. The mean population in the Suwanee River was estimated between 1,504 and 3,066 fish. This estimate was based solely on East Pass fishing efforts.

Wooley and Crateau (1985) estimated the population of Gulf sturgeon in the Apalachicola River at only 282 fish! It is of interest that FWS in their BO cited many studies on the Apalachicola and Suwanee River Gulf sturgeon, but they failed to discuss the paucity of sturgeons in the Apalachicola River versus the abundance of sturgeons in the Suwanee River. It would appear that FWS would try to mimic conditions (water quality, water flow, water depth, spawning substrate, etc.) present in the Suwanee River as closely as physically possible in the Apalachicola River in an attempt to increase its threatened sturgeon population.

Dr. Carter Gilbert, the most recognized ichthyologist in Florida, stated the importance of the Gulf sturgeon population in the Suwanee River. Carr et al. (1996) stated that *"Gilbert (1992) suggested that the Suwanee River supports the largest remaining spawning population of the Gulf of Mexico sturgeon. An unpublished manuscript by P. Meylan (Eckerd College, St. Petersburg, FL, 1977) estimated the sturgeon population of the Suwanee River at around 3,500. Our estimates indicated that the Suwanee River supports a population of approximately 2,500 individuals (87 cm TL/3 kg to 211 cm TL/81 kg). Wooley and Crateau (1985) estimated the population of Gulf of Mexico sturgeon in the Apalachicola River at 282 fish (fish >45cm FL). In addition, only small numbers of sturgeon have been sighted in other rivers of the Gulf of Mexico coast (Reynolds 1993). Therefore, we believe Gulf of Mexico sturgeon are not very abundant and the Suwanee River may, indeed, support the largest sturgeon population in the Gulf of Mexico."* (quotation from Carr, S. H., F. Tatman and F. A. Chapman. 1996. Observations on the natural history of the Gulf of Mexico sturgeon [Acipenser oxyrinchus desotoi, Vladykov 1955] in the Suwanee River, southeastern United States. *Ecology of Freshwater Fisheries* 5:169-174).

Clugston et al., 1995, studied the sturgeon population in the Suwanee River, Florida. They stated, "The Suwanee River continues to support the largest and clearly the most viable Gulf sturgeon population in the coastal rivers of the Gulf of Mexico. This river remains undammed and is relatively undeveloped and unpolluted." (cited from Clugston et al. 1995, page 217.)

Clugston et al., 1995, stated, "We are fortunate that the Suwanee River remains relatively unaltered by man and supports a Gulf sturgeon *population that seems to be increasing*. Much has been learned about the Gulf sturgeon population in this river, and *the information gained should be useful in restoration efforts throughout its range*." (cited from Clugston et al., 1995, p. 223; italics added for emphasis).

Despite all of the foregoing information about the optimal concentration of Gulf sturgeon in the Suwanee River, and suggestions by researchers that the information gained in this river system should be useful in restoration efforts throughout its range, FWS never attempted to match the Apalachicola River's flow rates or any other environmental parameter to approach as closely as physically possible to those of the Suwanee River. Nor, did they ever even discuss the possibility of attempting to match conditions.

XII. IMPACT OF THE EDO ON GULF STURGEON SPAWNING

I found no threats to the Gulf sturgeon due to the EDO. In the Amended BO, FWS presented graphs (p. 50, amended BO) that showed the acres of sturgeon spawning habitat inundated to depths of 8.5 to 17.9 ft deep at the two known Gulf sturgeon spawning sites on the river using flows of the 6 modeled scenarios. Under the 10th percentile hydrology, Gulf sturgeon spawning habitat would be reduced from an average of 13.0 acres with the IOP to 10.6 acres under both of the EDO options. This is only a 2.4 acre reduction. (p. 37, amended BO).

Using the 1999-2001 minus 20% hydrology, Gulf sturgeon spawning habitat is reduced from an average of 12.1 acres with the IOP to 10.5 acres under both of the EDO options. This is only a 1.6 acre reduction. (p. 37, amended BO).

My best professional opinion is that a 1.6 to 2.4 acre reduction in spawning habitat will not threaten the Gulf sturgeon's survival within the Apalachicola River. Spawning is not an act that is "willed" by ripe males and gravid females. It is controlled by powerful reproductive hormones and will take place whether the spawning habitat is 13 acres or 10.6 acres. According to population estimates of Gulf sturgeon in the Apalachicola River, only about 300 + individuals exist in that watershed. Assuming that only 50% of these are spawning during the same year (150 individuals), and that not all individuals spawn at the same time (i.e., earlier breeders would spawn during March while late spawners would spawn during May), then 10.6 to 13 acres is more than adequate area for successful spawning to occur at this one site (RM 105). Undoubtedly, numerous other spawning sites will be discovered in the future as FWS and other researchers perform in-depth spawning studies on Gulf sturgeon in the Apalachicola River.

XIII. Floodplain Inundation

Much emphasis has been given by FWS on the importance of floodplain inundation in the Apalachicola River in order to add nutrients to the river and the coastal bays downstream. However, the data collected by Randall and Sulak (1999) indicate that the Suwanee River is nutrient-poor and yet the Gulf sturgeon population does better there than in any other river system. A newborn sturgeon in the Suwanee River spends almost the entire first year of its life as a loner, foraging through a relatively sterile limestone and sand substrate in search of food. Yet, the recruitment in this population is excellent. It is my professional opinion that the additional nutrients added by floodplain inundation have little to do with the success of the Gulf sturgeon's survival in the Apalachicola River.

Additionally, Hupp (2000) explains the negative environmental impacts that can be produced by floodplain inundation. In particular, floodplain inundation increases the amount of suspended sediment in a river. Hupp states that suspended sediment in the rivers may be the most important water quality concern in the United States today. Suspended sediment directly affects aquatic plants and animals by coating vegetation and clogging the gills of fishes and invertebrates. Sediment indirectly changes the habitat from more coarsely grained aquatic environments into highly silted environments. Increased sediments also may lead to high sediment deposition in critical riparian areas, thus damaging living resources through burial and suffocation. More importantly, suspended sediment is a transport medium for hydrophobic forms of nutrients, trace elements, pesticides, poisons, pharmaceuticals, pharmaceutical metabolites, and other contaminants of all sorts. Regular flood plain inundation could lead to increased sedimentation and increased levels of harmful toxins in the river. However, FWS does not address these potentially harmful impacts to the Apalachicola that could occur due to floodplain inundation.

Lastly, while my report does not directly address the threatened and endangered mussels at issue in the Biological Opinion or Amended Biological Opinion, I would like to note that Cailteaux, et al. (DRAFT 2007), explains that stronger year classes of bluegill are associated with less acreage of floodplain inundation. This is significant in my opinion because bluegill are among the most numerous of fishes in the Apalachicola River and are recognized as one of the host fish species for the Fat threeridge and Chipola slabshell mussels.

In sum, significant material in FWS' administrative record suggests that floodplain inundation would have little, if any, positive impact on the Gulf sturgeon or the host fish for the threatened and endangered mussels. In fact, regular floodplain inundation could have substantial negative impacts on the river due to increased sedimentation and higher levels of toxins in the river.

CURRICULUM VITAE

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DATE OF BIRTH: 8 June 1940

EDUCATION:
1962 B.S., University of Alabama (Biology)
1964 M.S., University of Alabama (Biology)
1968 Ph.D., University of Alabama (Vertebrate Zoology)

PRESENT POSITION:
Professor of Biology, Department of Biology,
Samford University, Birmingham, Alabama 35229
June 1993 – 2007
Professor *emeritus* Retired 2007

PAST POSITIONS:

2007- Present Professor *emeritus*
1993-2007 - Professor of Biology, Samford University
1986-93 - Professor and Chair, Department of Biology, Samford University, Birmingham, Alabama
1984-86 - Professor of Biology, Samford University
1979-84 - Professor and Head, Department of Biology, Samford University
1976-79 - Professor of Biology, Samford University
1974-76 ¥ Associate Professor, Department of Biology, Samford University
1972-74 - Assistant Professor of Ecology & Systematics Cornell University, Ithaca, NY 14850
1969-72 - Associate Professor, Department of Biology, Samford University
1966-69 - Assistant Professor of Biology, Department Samford University
1965-66 - Graduate Teaching Assistant, Department of Biology, University of Alabama 35486
1962-65 - National Defense Education Act Fellow, Department of Biology, University of Alabama

SCHOLASTIC AND HONORARY AWARDS:

1982 ¥ Elected to Omicron Delta Kappa national leadership organization
1979 ¥ Elected to Phi Kappa Phi national honor society
1977 ¥ Buchanan Award for Excellence in Classroom Teaching
1975 ¥ Listed among top five outstanding professors, Cornell University
1967 ¥ Elected to Society of the Sigma Xi scientific honor society
1965 ¥ Beta Beta Beta national biological honorary society
1965 ¥ Graham Prize in Biology
1962-65 ¥ NDEA Title IV Fellowship

TEACHING EXPERIENCE:

Forty years of teaching experience.
Six years at Samford University, 1966-72
two years at Cornell University, 1972-74.
Thirty-two years at Samford University, 1974-2007

RESEARCH INTERESTS:

Endangered Fish Species
Vertebrate chromosome structure and function
Systematics of freshwater fishes
Effects of pollutants on freshwater fishes
Silver staining of vertebrate chromosomes
Masculinization of fishes by exposure to biodegraded plant sterols

GRANT AWARDS:

Samford University Research Fund Grant numbers 48, 59, 62, and 64, totaling $1,850 for the years 1974-76 to study the mechanism of silver binding to human chromosomes.

National Science Foundation Grant No. NSF PCM 76-82828. 1976-78. $16,000 grant to study nucleolus organizer regions in human chromosomes.

National Science Foundation Grant No. DEB 76-84195. 1976-78. $34,000 grant to study fish chromosomes.

National Science Foundation Grant No. PCM 79-17344. 1980-82. $38,498 grant to study silver staining patterns in nucleolus organizer regions of human metaphase chromosomes derived directly from solid tumor cells.

Samford University Research Fund Grant No.13. 1985-87. $2,000 grant to study plant sterol-induced changes in secondary sex characteristics of the mosquitofish, *Gambusia affinis*.

EPA Grant #R826130-01 1998-2000. $321,000 grant to develop a short-term in vivo screening system for endocrine disruptors utilizing mosquitofishes (co-investigator with Dr. Rob Angus of UAB).

PROFESSIONAL SOCIETIES:

American Society of Ichthyologists and Herpetologists

Somatic Cell Genetics Conference

Southeastern Fishes Council

Alabama Fisheries Association

Alabama Academy of Sciences

EDITORIAL BOARD:

Appointed to editorial board, *Copeia,* American Society of Ichthyologists and Herpetologists, 1978

Appointed to editorial board, *Brazilian Journal of Genetics,* now renamed, *Genetics and Molecular Biology* 1997

Appointed to editorial board, *Genetics and Molecular Research*, 2002

PEER REVIEWER FOR SCIENTIFIC JOURNALS:

I have been a frequent reviewer for manuscripts in the following journals:

American Midland Naturalist
Chromosoma
Copeia
Genetics and Molecular Biology
Jour. Histochemistry & Cytochemistry
Stain Technology
The Brazilian Journal of Genetics
The Southwestern Naturalist
Transactions Americans Fisheries Society

INVITED SPEAKER: The following are select topics on which I have been invited to speak:

"Silver Staining of Chromosomes: Visualization of Ribosomal Gene Activity" Biology - Forum Invited Speaker Series, 18 October 1979 at University of Alabama.

"Bioethics" -Forum on Bioethics, 27 April 1981 at Comer Auditorium, University of Montevallo.

"Silver Staining of Chromosomes and Cell Organelles" Invited talk, September 1982 at Wayne State University, Detroit, Michigan.

Vertebrate Chromosomes Structure¥ Invited Speaker Series, 23 March 1984 at Department of Biological Sciences, Mississippi State University, Starkville, MS.

"Environmental Formation of Androgens and Fish Masculinization¥ October 18, 1999. Invited Speaker at The Symposium Marking the 20th Anniversary of the first Meeting on Estrogens in the Environment". Center for Bioenvironmental Research at Tulane and Xavier Universities, New Orleans, LA.

TRAVEL: Served as Professor-in-Residence at Samford Universitys London Study Centre, London, England, August¥ December 1987. Traveled extensively throughout England, Wales, Scotland, Ireland and France.

COURSES TAUGHT:

- General Biology
- Zoology
- Vertebrate Field Zoology
- Invertebrate Field Zoology
- Genetics
- Man & the Environment
- Human Anatomy & Physiology
- Speciation (Graduate)
- Biology of Fishes
- Biogeography (Graduate)
- Ichthyology (Graduate)
- General Science for School Teachers

<u>LIST OF BOOKS, PUBLICATIONS AND THESIS:</u>

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Written Comments of Dr. Terry D. Richardson on the U.S. Fish and Wildlife Service's Biological Opinion and Conference Report on the U.S. Army Corps of Engineers Interim Operating Plan and the Associated Releases to the Apalachicola River

September 25, 2007

I. Introduction

I am a malacologist and Associate Professor of Biology at the University of North Alabama. I am providing these comments in response to the U. S. Fish and Wildlife Service's Biological Opinion ("BIOP") (as revised on September 22, 2006) relative to the potential effects that the U. S. Corps of Engineers' Interim Operating Plan ("IOP") could have on the flow volume of the Apalachicola River and the resultant effects on the endangered fat threeridge mussel (*Amblema neislerii*), threatened purple bankclimber mussel (*Elliptoideus sloatianus*) and threatened Chipola slabshell (*Eliptio chipolaensis*). My comments reflect my professional opinion, for which I am fully responsible and in no way represent the views of my current employer (The University of North Alabama).

II. Comments on FWS' BIOP

Sec. 2.2.3.3 Mussel Reproduction

FWS cites Hove and Neves 1994 (Administrative Record [AR] Vol. 6, No. 210) suggesting spawning may be influenced by discharge, but they fail to state how this is so. (BIOP p. 30). Hove and Neves' (1994) data suggest that glochidia release is coincident with low, mean summer discharges (over and order of magnitude less than April/May discharges). This is reasonable since "Host fish density may be a factor in determining where amblemines, which include the three listed mussels addressed in this BIOP, may persist." (BIOP p. 32). By extension, low flows typical of summer and fall, when fat three-ridge release glochidia, may tend to concentrate host fish (out of floodplains and into channels of overall lower volume) making them more likely to be parasitized by mussel glochidia and thus enhancing mussel reproductive success. This also suggests that flows too high in the summer and fall (above what might be normally expected), as advocated by FWS, might adversely affect mussel reproduction by effectively "diluting" the host fish density.

Similarly, high late spring discharges during breeding, not brooding (*i.e.*, during male gamete release), could adversely impact reproduction by diluting male sperm. Male mussels broadcast their sperm into overlying water to then be siphoned in by ripe females thus fertilizing eggs. Excessive late spring discharges during this period could reduce the likelihood of successful fertilization by reducing the concentration of male sperm in the water. Indeed, regarding both successful fertilization and host fish infestation, successful reproductive years may coincide with or follow low flow or drought year conditions. This is supported by qualitative and quantitative samples taken in 2005 and 2006 by the FWS and EnviroScience. Results of these samples indicate the most abundant age classes of fat threeridge to be those produced during drought between 1998 and 2001 (BIOP Figure 2.2.3.2.B, p. 42). This suggests too high flows in the spring could impede fertilization and be detrimental to reproductive success.

Sec. 2.2.4 Status and distribution

The fat threeridge, purple bankclimber, and Chipola slabshell tend to be main channel species. "Records for the fat threeridge are limited to main channels of the Apalachicola, Flint and Chipola rivers and a few tributaries and distributaries . . . ." (BIOP p. 35 sec. 2.2.4.1). "The purple bankclimber is characterized as a species preferring the deeper portions of the main channels (often at depths greater than 3 m) in the larger rivers within its range . . . ." (BIOP sec.

3.5.3.2, p. 66). "The Chipola slabshell inhabits . . . large creeks and the main channel of the Chipola River in slow to moderate current." (BIOP sec. 2.2.3.4.3, p. 35). Essentially, FWS correctly points out that these listed mussels tend to be main channel species and not species typical of sloughs or elevated side channels. Indeed, FWS hypothesizes the listed mussels found in sloughs or elevated side channels like Swift Slough and other "hooks and bays" of the Apalachicola main channel likely came to be in these sites due to extended periods of very high flow during 2005, *i.e.*, "[The FWS] believe that large numbers of mussels were moved from the main channel into these side-channels and sloughs during high flow either in the spring of 2005 or following Hurricane Dennis in July 2005" (BIOP sec. 2.2.4.1, p. 37). In other words, these are aberrant populations with high densities that the FWS believe resulted from "an anomaly related to a substantial export of individuals from the main channel of the Apalachicola during high-flow events . . . ." (BIOP sec. 3.5.2.2, p. 65).

In 2006, FWS conducted a limited surveyed to document mortality and stranding of listed mussels in these aberrant locations. At the nine sites from which data are presented (BIOP Table 3.5.2.1.A, p. 88) only one site had greater than 30% mortality (82.4% at Z142) of all observed mussels and only three sites had 40% or more of the mussels exposed. Most mortality was around 20% or less and most exposure was under 24%. Mortality and exposure at 8 of the 9 sites were at discharges equivalent to 6600 cfs or less; none of the sites were at discharges of over 7200 cfs. FWS contends that "most of the mortality due to low flow we observed . . . was either in elevated side channels along the main channel of the river and Chipola Cutoff, or in Swift Slough" (BIOP sec. 3.5.2.1, p. 62), *i.e.*, not main channel sites, but rather these aberrant locations. Yet, FWS tries to use this 2006 mortality event of listed mussels, mainly of fat threeridge, living in these aberrant locations (Swift Slough, and in hooks and bays off the main channel) to justify recommending the IOP minimal discharges be increased from 5,000 cfs to 10,000 cfs. While the FWS says they "believe" that the 2006 mortality event had a significant impact on the population, they state that they also "believe that sufficient numbers for recovery likely persist in reaches that were not so strongly affected by the hurricane and subsequent sustained low flows." (BIOP sec. 2.2.4.1, p. 37).

There are essentially two points to make. First, given FWS's suggestion that these are indeed aberrant, abnormal, locales for the listed mussels, and because FWS says the proposed action in the IOP will neither a) jeopardize the continued existence of the fat threeridge, purple bankclimber, and Chipola slabshell, nor b) destroy or adversely modify proposed critical habitat for the fat threeridge, purple bankclimber, and Chipola slabshell, one wonders why they insist that discharge be raised from 5,000 cfs to 10,000 cfs. This is especially true when considering that most of the mortality FWS references occurred at discharges less than 6,600 cfs and most of this in aberrant locations. This seems to argue favorably that flows certainly do not need to be raised to anywhere near 10,000 cfs.

Second, if the individual mussels at these anomalous sites are indeed important to the continued existence of these species (which the FWS clearly thinks they are not), then the FWS should have proposed as a reasonable and prudent measure (RPM) the relocation of these individuals. It cannot be emphasized enough that relocation of mussels is a standard mitigation procedure employed routinely by FWS when members of a listed mussel population may be in harm's way. Since relocation is a standard FWS recommended procedure, it is difficult to understand why FWS recommends an increase in minimal discharge from 5,000 to 10,000 cfs, especially when relocation alone would suffice and remove the issue of detrimental impacts of low discharge (regardless of source) altogether. After all, the vast majority of these mussels, at least according to FWS, previously lived elsewhere and safely survived the drought of 1999-2002 with low flows similar to those of 2006.

Additional Comments

FWS devotes over two pages (pp. 49-51 & 75-76) to the geomorphic instability of the Apalachicola downstream of Woodruff dam. Conversely, FWS later devotes considerable attention to how the CH PCE of "geomorphic stability" *is* sufficiently present in this same reach. So, is it geomorphically stable or not? It seems the BIOP is trying to argue both ways. Regardless of whether this reach of the Apalachicola is stable or not, FWS does not point out that this is the way it has been since J. Woodruff began operation, yet the mussels persist. Increased flows will only serve to increase any purported geomorphic instability.

Similarly, FWS in trying to emphasize how bad unstable substrate is for these mussels, and suggests that unstable substrate conditions resulted in the mussels being deposited in aberrant areas. However, they fail to point out what is clearly inferred from their presentation--that given the tumultuous event that resulted in the deposition of the mussels in these aberrant locations and the mussels' subsequent success in these areas, these mussels have the demonstrated ability to handle unstable substrate conditions. (see discussion p. 76)

EDO Comments

The EDO once again raises the issue of channel stability. On page 15-16 of the EDO Amended Biological Opinion the FWS is again making a case for channel stability and suggests that the impacts of J. Woodruff Lock and Dam have been reduced through time. However, it is not at all clear from the BiOp or Amended BiOp whether or not operations are affecting stability, and if so, at what flows. These points need to be addressed and clarified with a definitive agency position providing justification for any recommended operating procedure. Knowing whether operations contribute to channel stability or instability is important in assessing how this will impact critical habitat for listed species.

The EDO Amended BiOp includes recent information on the listed species that was unavailable when the original BiOp was produced. For example, the fat threeridge is far more abundant than previously thought (p. 19). Additionally, the Swift Slough population, where most of the drought-related mortality reported for this species occurred, exists only because of an "extraordinary even" (p. 63) that moved the mussels into that area. As a result, this is an anomalous, aberrant population. If this aberrant population, which does not represent the normal circumstances for this species, is removed from mortality calculations, and we look at mortality based on flow conditions for the normal locations of the mussels, then using the new, more abundant population size estimates, mortality would be more like 12% rather than the purported 18% at low flows. Furthermore, the new population data indicate no fat threeridge were sampled at depths corresponding to flows of $\geq$ 5,000 cfs and mortality did not exceed 5% until depths corresponding to flows of less than 4,600 cfs (Amended BiOp Table 4.2.6.A, p. 53). Similarly, the FWS present additional information suggesting that only after flows fall below 5,000 cfs would problems with DO and temperature exacerbate habitat conditions for the fat threeridge (Amended BiOp p. 25). The additional date reflecting lower mortalities, higher population estimates, and giving a clearer picture of depth and distribution versus flow, need to be used when considering appropriate, allowable flows.

Similar arguments could be made for the Purple Bank Climber. New information appearing in the EDO certainly indicate the Purple Bankclimber to be more common than previously thought (compare Fig. 3.6.1.2.A, p. 102 in BiOp to Fig. 3.5.3.A, p. 31 in Amended BiOp). Also, FWS correctly indentifies the Purple Bankclimber as a species that "prefers deeper portions of the main channel (often > 3 m)." Yet, only 4.6% of all sampling effort (27 of 583 samples) was done at depths exceeding 3 m (Amended BiOp p. 21). So, even more populations may exist in the deeper channel areas as yet not surveyed. While some populations of Purple Bankclimber are found in shallow areas, these animals do indeed prefer depths more consistent with the main channels, depths unlikely to be impacted by low flow conditions. The new data regarding both Purple Bankclimber and Fat Threeridge need considered for determine appropriate allowable flow conditions.

In conclusion, it seems that data in the EDO thoroughly support the argument that flows as low as 5,000 cfs should have no affect on the listed mussels and flows even lower, down to around 4,500 cfs, would likely have little affect on the mussels.

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CURRICULUM VITAE

Personal:

Born September 11, 1960, Florence, Alabama; single, no children.

Education and Experience:

B.S. in Professional Biology (Chemistry minor), University of North Alabama, 1982.
M.S. in Aquatic Ecology, University of Alabama, 1986. Thesis Title: "Life Histories and Secondary Production of Two Coexisting Pleurocerid Snails"
Ph.D. in Zoology (Physiology minor), Louisiana State University, 1990. Dissertation Title:"Factors Affecting the Foraging Ecology of the Rock Snail, *Stramonita haemastoma*"
Oak Ridge Associated Universities' Postdoctoral Fellow in the Environmental Sciences Division, Aquatic Toxicology Section of Oak Ridge National Laboratory, 1990-91.
Director, Rare and/or Endangered Species Research Center, 1994-2004.
Oxford Round Table, University of Oxford, Saint Anne's College, Oxford, England. August 2007.
Currently Associate Professor of Biology at the University of North Alabama, 1991-present.

Awards:

R. L. Chermock Award for outstanding performance as a graduate assistant. Awarded by the Dept. of Biology, University of Alabama.
W. H. Gates Award for Outstanding Teaching Assistant. Awarded by Dept. of Zoology and Physiology, Louisiana State University.
Honorable mention by the North American Benthological Society for research on subtropical freshwater gastropod production.
Oak Ridge Associated Universities Postdoctoral Fellowship.
Oxford Round Table Member, University of Oxford, Saint Anne's College, Oxford, England.

Funding:

"Foraging ecology of Caribbean spiny lobster"; 1 year UNA Arts and Sciences Research Support. 2008. $2,000.00(research)

"Foraging ecology of Caribbean spiny lobster"; 1 year UNA Arts and Sciences Research Support. 2007. $2,000.00(research)

"Foraging ecology of the Caribbean spiny lobster"; 1 year UNA

Faculty Research Support. 2007. $4,800.00(research)

"Land/water interfaces: regulation of biogeochemical cycles and productivity by organic matter"; 3 year NSF /EPSCoR (1993-96; complete) $62,766.00(research)

"Colonization of Tennessee River bivalves by the invading Zebra Mussel, *Dreissena polymorpha*"; 2 year research contract with the Tennessee Valley Authority (1992-94; complete) $43,367.00(research)

"A survey of the primary tributaries of the Alabama and lower Tombigbee rivers for listed and candidate species o f freshwater mussels, snails, and crayfish,1994-96"; contract for freshwater snail identification with the Alabama Geological Survey (complete) $ 1,500.00(research)

"Bioremediation of oil contaminated freshwater wetland ecosystems: invertebrate recovery"; 1 year research grant with the Environmental Protection Agency and Tennessee Valley Authority (1998-99; awarded, but declined by PI) $26,500.00(research)

"Biochemical adaptations to hypoxic and anoxic conditions in the snail, *Elimia paupercula*"; 1 year UNA (1995; complete) $18,890.00(research)

Coastal Fisheries Institute (complete) $ 800.00(research)

Sigma Xi grant in aid of research (complete) $ 400.00(research)

Consulting with Written Reports:

Paul Yokley, Jr., Florence, AL. T & E Surveys for listed mussels: (1) new bridge crossing over Black Warrior River near Eutaw, AL; (2) new Patton Island bridge crossing over Tennessee River in Sheffield/Florence, AL; (3) proposed City of Florence waste water treatment facility diffuser effluent pipe in Tennessee River. 1992-1995.

Tri-Rivers Mussel Coalition, Dothan, AL. Review of status survey and proposed listing of seven mussels in the Apalachicola River drainage of Alabama, Florida, and Georgia. 1995-96.

F.W. Dougherty Engineers, Birmingham, AL. T & E Survey of listed mussels on the Cahaba

River NE of Birmingham for pipeline construction purposes. 1998.

Summit, Inc. Geological and Environmental Consulting. Continuing Contract. Surveyed several proposed pipeline creek crossings for T & E aquatic organisms (listed fish and mussels). Surveyed several pipeline sites for T & E vascular plants. Conducted several wetlands delineations. 1998-present.

Burgreen Construction, Inc. Wetland assessment and delineation. 1999.

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Martin Marietta, Auburn, AL. Stream T & E Survey for listed mussel species and water quality. 2000-2001.

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Alabama-Tombigbee Rivers Coalition; Review of proposed listing of critical habitat for federally listed mussels in the Alabama-Tombigee River drainage. 2003-present

Planning Committee of the Florence City Council, City of Florence. Environmental consultant for the development of the Eddie Frost Commerce Park. 2003-present

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Limestone County, AL. T & E Survey. Piney Creek. August 2007.

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Teaching Experience:

General Biology I and II
Introductory Zoology I and II
Invertebrate Zoology
General Ecology
Marine Ecology
Aquatic Ecology
Tropical Marine Ecosystems
Human Anatomy and Physiology
Comparative Anatomy of Vertebrates
Histology
Animal Physiology
Biochemistry
Marine Behavioral Ecology

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Cengage Publishing Company. 2008. Freshman textbook author workshop. San Francisco, CA.

Richardson, T. D. 2007. Foraging ecology of the Caribbean spiny lobster: studies in Belize and the Florida Keys. UNA Faculty Brown Bag Seminar.

Richardson, T. D. 2007. Caribbean coral reefs: biology and ecology. SEAS scuba club in Huntsville, AL.

Richardson, T. D. 2004. Marine Biology as a Career Choice. Berry Elementary School, Berry, AL.

Thompson Publishing Company. Freshamn textbook workshop. San Diego, CA.

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*Sweda, M. T. and T. D. Richardson. 2008. Prey size selection in Caribbean spiny lobster, *Panulirus argus*, when foraging on dwarf cerithid snail, *Cerithium lutosum*. In press, Southeastern Biology, 55.

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*Bone-Stickland, S., T. Richardson, and F. Romano. 2001. The aestivation physiology of a prosobranch snail, *Viviparus georgianus.* Assoc. Southeast. Biol. 48. Abstract and talk.

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Scheiring, J. F. and T. D. Richardson. 1986. Factors affecting the distribution of insects in low order streams with different geologies. Bull. N. Amer. Benthol. Soc. 3: 105. Abstract.

* Student presentations.

Professional Societies and Service:

Association of Southeastern Biologists—member 1982-present.

Association of Southeastern Biologists—served on Student Awards Committee, Poster Awards Committee, Executive Committee Member-at-Large, Secretary 2000-2006, Associate Editor 2000-2006, Web Editor 2003-2006.

Ecological Society of America—member 1985-2006.
North American Benthological Society—member 1985-2006.

FRANKLIN COUNTY

REPLY TO ☐

BOARD OF COUNTY COMMISSIONERS
33 MARKET STREET, SUITE 203
APALACHICOLA, FL 32320
(850) 653-8861, EXT. 100
FAX (850) 653-4795

REPLY TO ☐

PLANNING & BUILDING DEPT.
34 FORBES STREET, SUITE 1
APALACHICOLA, FL 32320
(850) 653-9783
FAX (850) 653-9799

PD-EI
Zettle

May 13, 2008

Ms. Gail Carmody, Supervisor
U.S. Fish and Wildlife Service
1601 Balboa Ave.
Panama City, FL 32405-3721

Mr. Curtis M. Flakes, Chief
Planning and Environmental Division
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001

RE: Comments on Proposed Revision to the Interim Operations Plan at Jim Woodruff Dam

Dear Ms. Carmody and Mr. Flakes:

The Franklin County Board of County Commissioners received a copy of Florida Dept. of Environmental Protection Secretary Sole's letter dated April 30, 2008 to Ms. Gail Carmody and Mr. Curtis Flakes opposing the US Army Corps of Engineers' ("Corps") proposed revision to the Interim Operations Plan. The Board is in agreement with Secretary Sole. The modifications the Corps is proposing are going to continue to degrade the ecological and economic significance of the Apalachicola Bay. Left uncorrected, the Corps' latest proposal will jeopardize certain protected species (Gulf Sturgeon), and will have the same disastrous impact on other economically significant estuarine species (shrimp, crab, and mullet as examples). The Board is adamant that the economic hardships caused by the low flows in 2007 not be repeated in the future. The minimum flows must be kept well above 5,000 cfs. The Fish and Wildlife Service (FWS) must be directed to include the analysis of the Apalachicola Bay and its resource based economy when preparing its comprehensive biological assessment.

The Board submits the following evidence of the damage the Corps' water flow management has done to harvestable species in Franklin County. The attached data were obtained from the Florida Fish and Wildlife Conservation Commission for the period 1986 to 2007. Landings of White Shrimp were the lowest in 20 years. Landings of Brown Shrimp were the lowest in 20 years. Landings of Blue Crabs were the second lowest in 20 years. Landings of mullet were the lowest in 20 years. Oyster harvesting was up but so was the number of trips taken to harvest oysters, so now there is increasing harvesting pressure on that resource because of the failure of the other resources.

The Corps has been in a rush to judgment and that too must stop. Normally, 120 days is the time allowed to complete the biological assessment. In the height of the drought in 2007, the assessment was done in 15 days. Now, in 2008, 45 days has been allotted. To the residents of Franklin County, such a short time frame means that no meaningful assessment is being done. Not only is the single most significant component of the ecosystem being left completely out of analysis- the Apalachicola Bay, but what little analysis being done on the River ecosystem is apparently being done in haste. With a system in near collapse, the Board requests that the FWS do a proper and thorough evaluation using the time alloted: 120 days.

Secretary Sole's letter forcefully challenges additional assumptions embedded in the Corps' modeling. The Board agrees with the Secretary. The Corps does not have the legal authority to maintain water levels for the purpose of water supply. The Corps appears to be uninterested in the correlation between salinity, water temperature, and freshwater flow. And, the Board supports the State of Florida's contention that the Corps could be culpable for the loss or "taking" of species when it reduces flows during spawning seasons.

The Apalachicola Bay is the premier water body in the state of Florida. It has many environmental designations which befit an ecosystem as productive as it is. The Board asks only that the Corps recognize the tremendous resource the Bay is to the country, and do the right thing. Please protect the water flows.

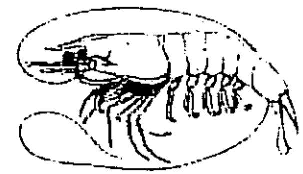
Sincerely,

Noah Lockley Jr.

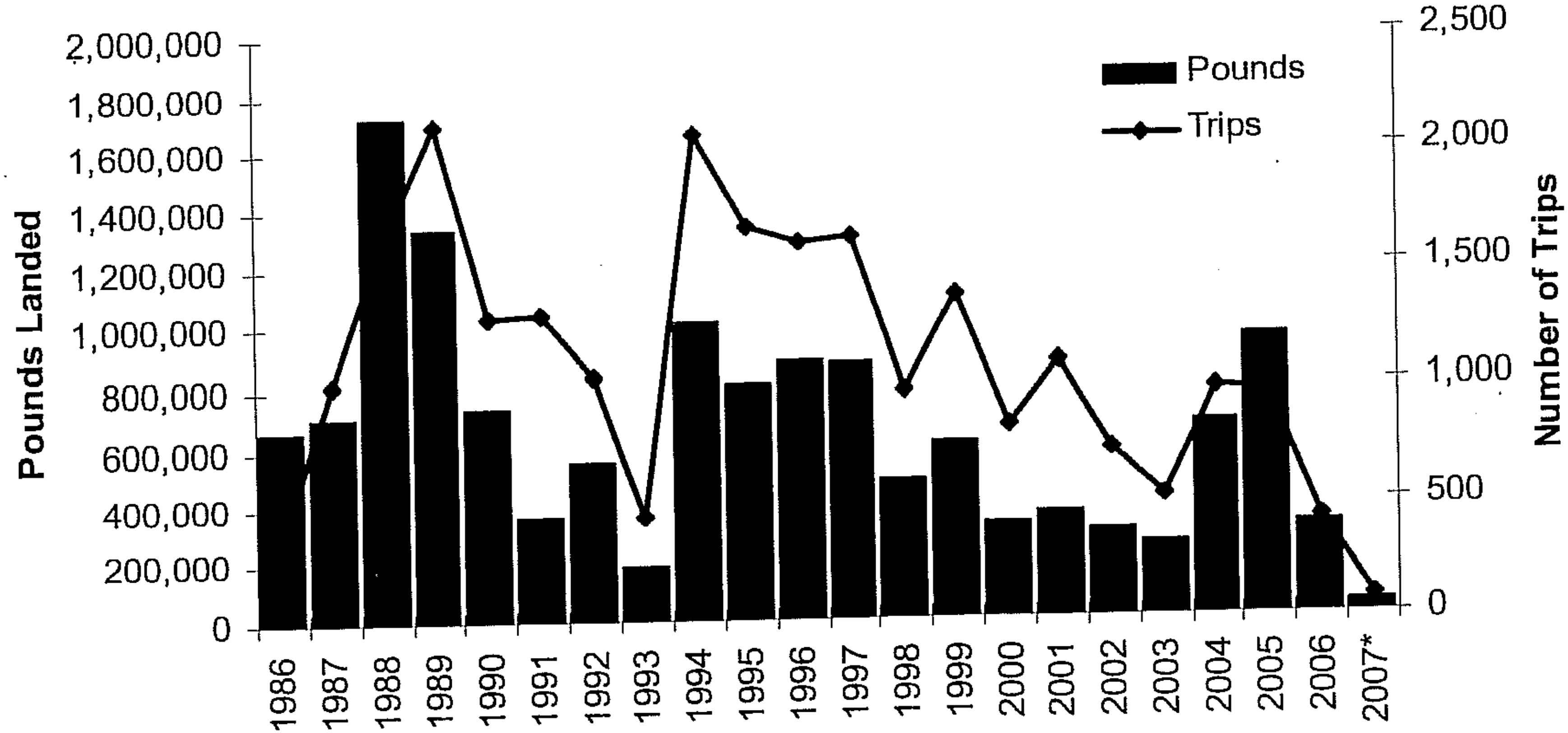
Noah Lockley, Jr., Chairman
Franklin County
Board of County Commissioners

NL/acp

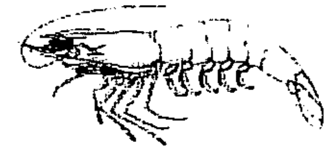
Enclosures (5)
Cc: Senator Bill Nelson
Representative Allen Boyd
FDEP Secretary Mike Sole



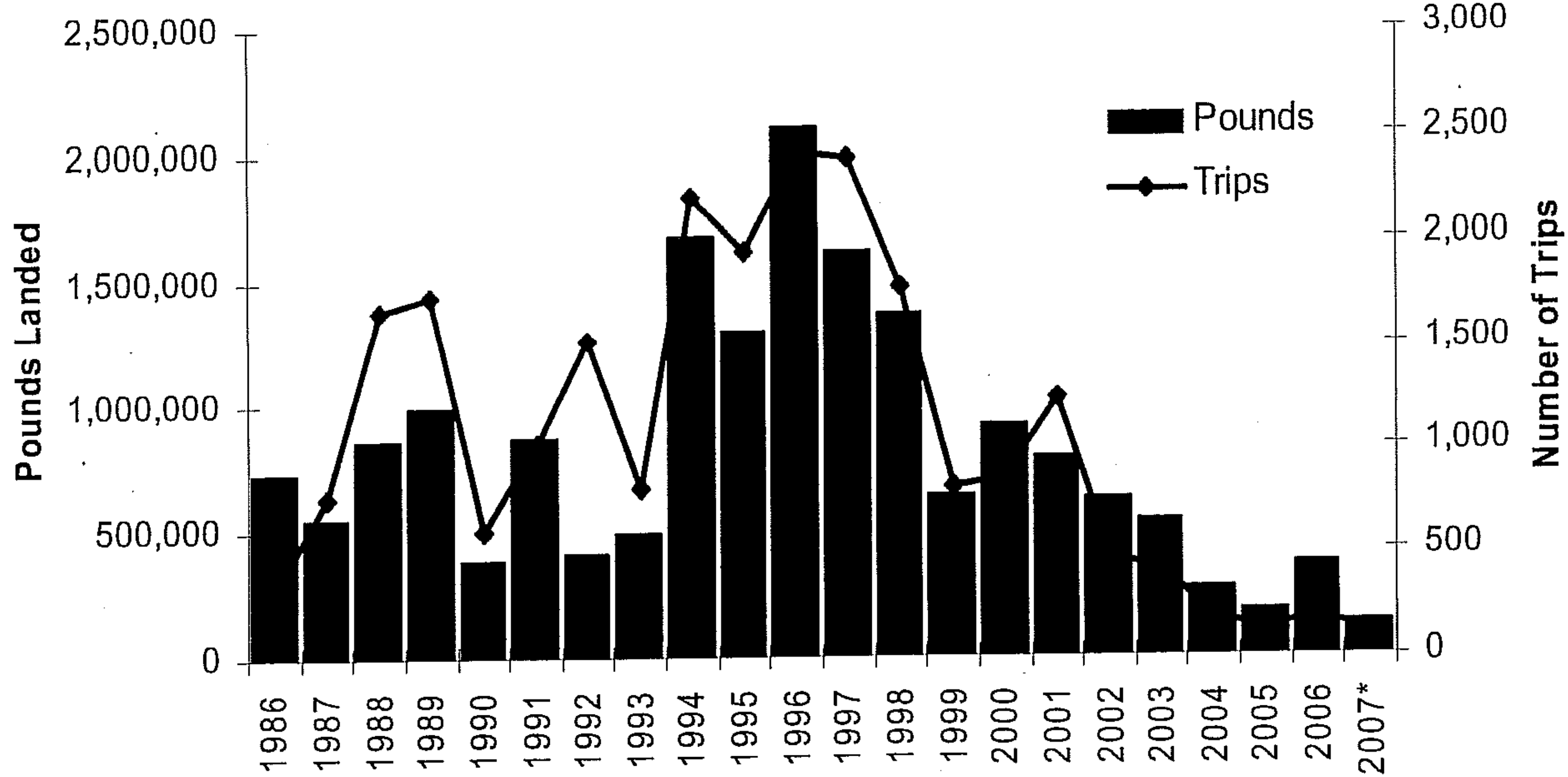
White Shrimp Landings and Effort 1986-2007*



*data preliminary, as of 01/09/08

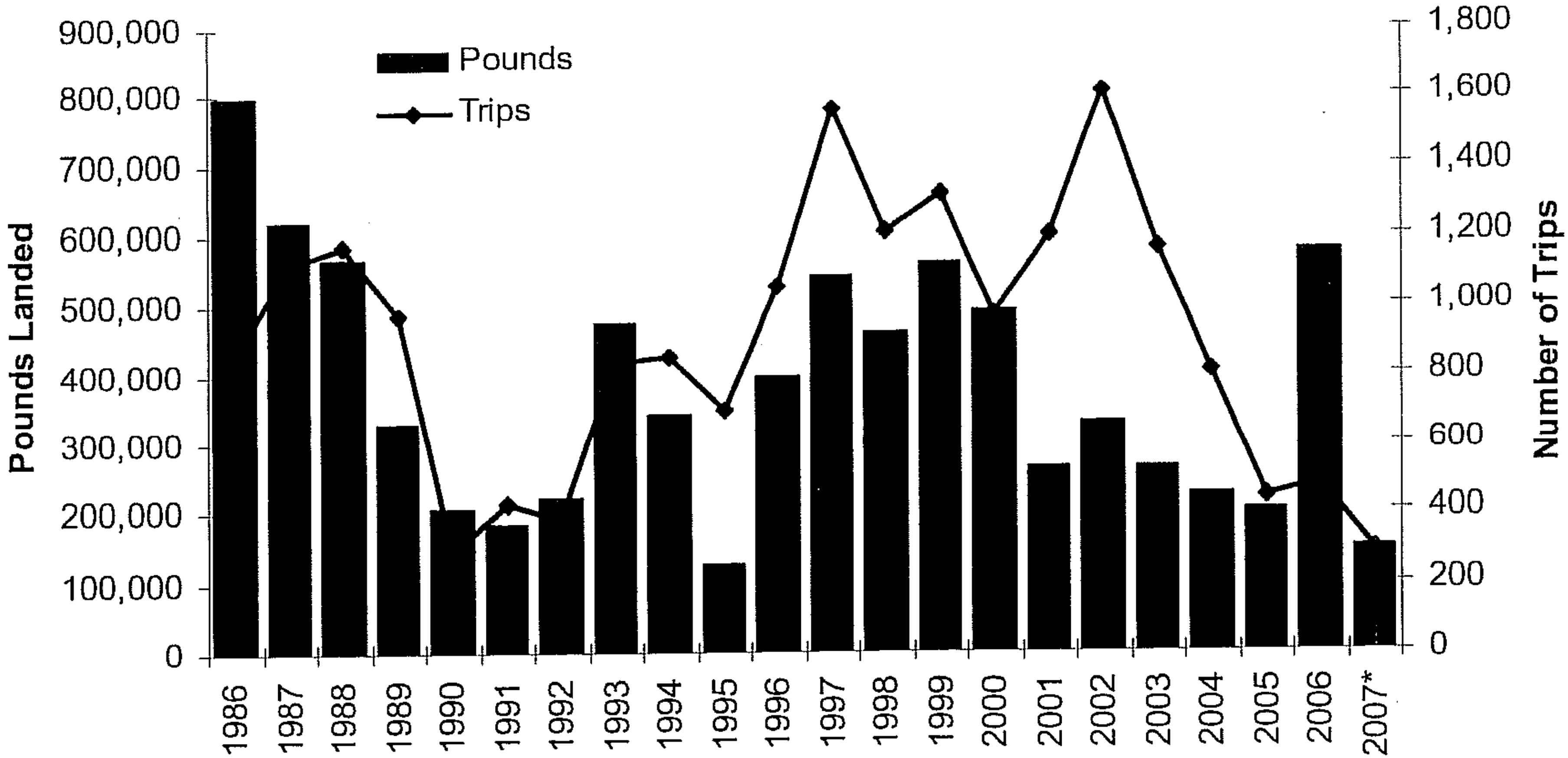


Brown Shrimp Landings and Effort 1986-2007*



*data preliminary, as of 01/09/08

Blue Crab (Hard Shell) Landings and Effort 1986-2007*



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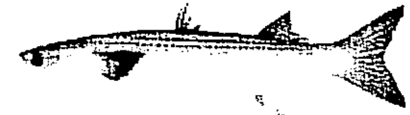

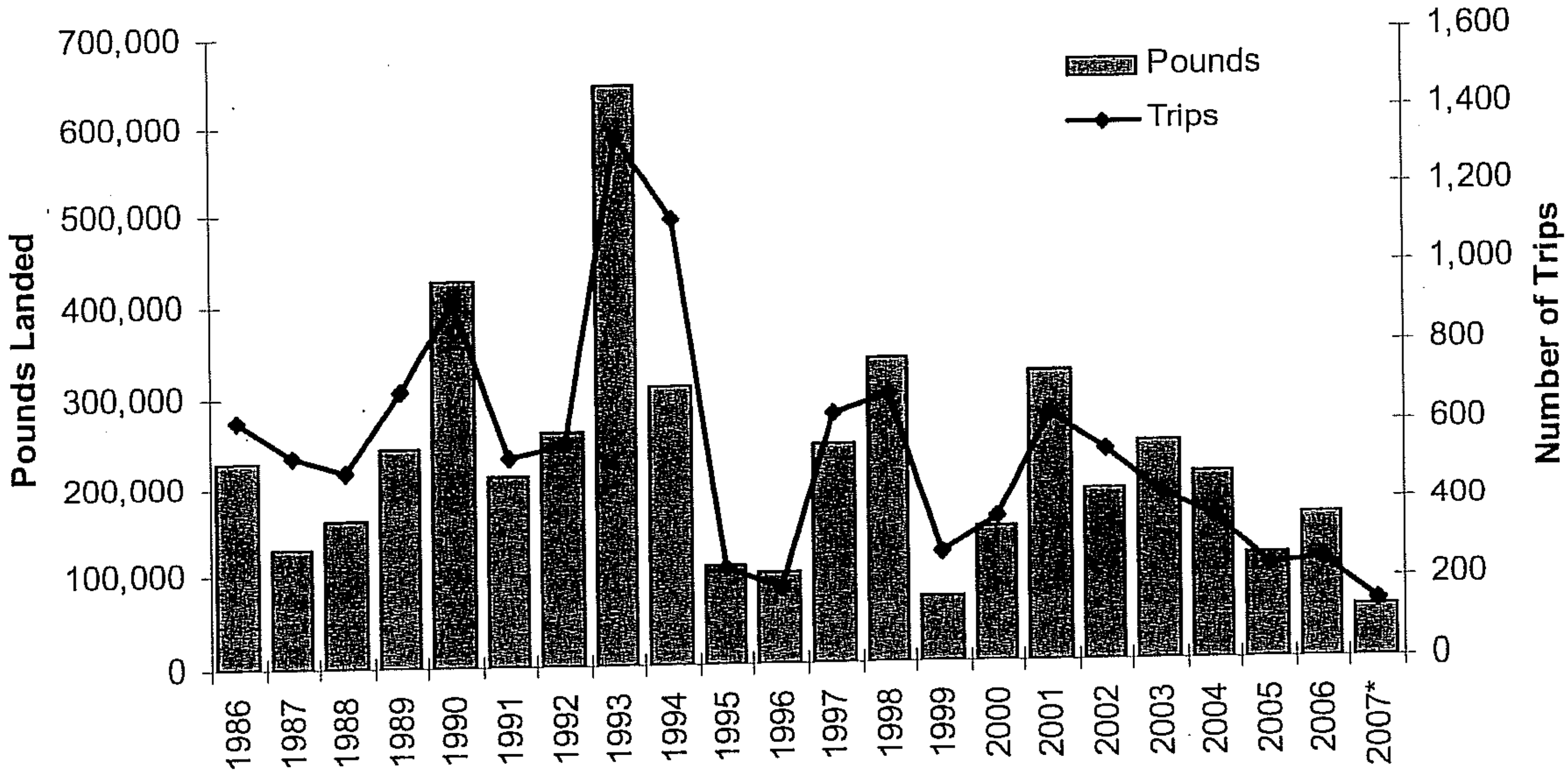

*data preliminary, as of 01/09/08

MONHTLY LANDINGS

Oyster Landings

avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
1986-89	108,063	103,146	184,391	164,928	156,048	93,769	158,761	60,691	35,978	105,613	92,148	118,471	1,382,005
1990-94	153,329	141,476	140,805	152,051	148,946	142,087	127,624	82,812	59,144	140,649	158,044	176,800	1,623,767
1995-99	135,918	109,857	114,790	119,789	112,755	98,049	97,079	77,373	58,550	142,169	161,363	158,474	1,386,165
2000-04	190,093	188,993	181,970	164,423	151,847	132,971	153,881	117,590	81,028	183,842	143,884	180,203	1,870,722
2005	181,803	163,589	169,500	131,155	137,271	129,159	58,517	79,196	13,686	0	23,138	180,652	1,267,666
2006	146,632	158,835	145,713	126,577	137,939	141,391	190,271	113,672	238,081	234,030	248,064	245,844	2,127,049
2007*	272,672	247,087	215,063	211,868	188,901	219,840	184698	132415	188039	216253	178385	132092	2,387,313
diff in 2007													
from 2006	86%	56%	48%	67%	37%	55%	-3%	16%	-21%	-16%	-28%	-46%	12%
rom 2000-04	43%	31%	18%	29%	24%	65%	20%	13%	132%	6%	24%	-27%	28%

Oyster Trips

avg	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	ANNUAL
1986-89	1,829	1,743	3,139	2,442	2,608	1,918	2,448	1,554	966	2,061	1,777	2,089	24,573
1990-94	2,282	1,967	1,846	2,190	2,181	2,242	1,842	1,488	1,103	2,124	2,287	2,426	23,977
1995-99	1,520	1,292	1,358	1,354	1,386	1,163	1,129	938	739	1,644	1,745	1,682	15,949
2000-04	2,139	2,148	2,097	1,925	1,823	1,589	1,741	1,445	1,033	2,018	1,608	1,933	21,499
2005	1,731	1,669	1,743	1,278	1,382	1,380	542	861	157	0	231	1,766	12,740
2006	1,750	1,860	1,751	1,429	1,645	1,384	2,246	1,437	2,178	2,273	2,371	2,320	22,644
2007*	2,673	2,430	2,580	2,228	2,037	2,391	2,390	1,801	2,122	2,399	1,724	1,332	26,107
diff in 2007													
from 2006	53%	31%	47%	56%	24%	73%	6%	25%	-3%	-5%	-27%	-43%	15%
rom 2000-04	25%	13%	23%	16%	12%	50%	37%	25%	105%	7%	7%	-31%	21%

* Data preliminary, includes reported landings as of 01/09/08 (batch 983)

Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive, Suite 1152 East Tower, Atlanta, Georgia 30334
Noel Holcomb, Commissioner
Carol A. Couch, Ph.D., Director
Environmental Protection Division
(404) 656-4713

May 15, 2008

By Email, Fax and Overnight Delivery
Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL 42305-3721

Mr. Curtis M. Flakes
Chief, Planning and Environmental Division
Mobile District
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001

RE: Endangered Species Act Section 7 Consultation on the Corps' Proposed Modifications to the Interim Operations Plan

Dear Ms. Carmody and Mr. Flakes:

The State of Georgia provides the following comments on the Corps' proposed modifications to their Interim Operations Plan ("Modified IOP") for its reservoirs in the Apalachicola-Chattahoochee-Flint ("ACF") River Basin as described in the Corps' letter to the Fish and Wildlife Service on April 15, 2008. Although the Modified IOP, if ultimately implemented as proposed, will make some positive changes to the IOP under which the Corps operated in 2006 and 2007, it suffers from some of the current IOP's significant defects. These flaws will result in releases from the Corps' reservoirs in the ACF Basin that are in excess of what the best scientific and technical information indicate are necessary for the federally protected species in the Apalachicola River. The excessive releases could continue to needlessly deplete storage in the upstream federal reservoirs, storage that will be necessary for vital needs, including species protection, in the event of significant droughts.

At the outset, let me emphasize that it is Georgia's understanding that the Modified IOP is intended to be a temporary, short term operating regime, lasting only until the Corps completes its update to the water control manual for the ACF Basin. Earlier this year, the Corps gave notice of its intent to update that water control manual, 73 Fed. Reg. 9781 (February 22, 2008), and the Corps repeatedly has given Georgia assurances that it intends to complete that process. The Corps has stated that the process should take approximately two years, and that the resulting water control manual will establish longer-term operating plans, rules, and procedures for the ACF reservoir. The below comments concerning the Modified IOP, then, are made with the assumption that the Modified IOP (potentially subject to further alteration) will only be the plan that is in effect for approximately another year to two years, and that it will not provide the basis, framework, or starting point, for the longer-term plan. Georgia believes that a longer-term plan should be focused and structured differently so as to optimize the storage in the ACF Basin for all uses, and should be developed in accordance with the mandatory procedures for water control plans, including full, before-the-fact, environmental analysis under the National Environmental Policy Act. Georgia plans to participate actively in the process of updating the ACF water control manual and will provide comments on a longer-term plan at that time.

The Modified IOP's Drought Contingency Provision is a Positive Change

The Modified IOP adds to the IOP a much-needed drought contingency provision. Under the extreme drought conditions in 2007, the IOP as described in the Corps' Interim Operation Plan Concept 5 ("IOP 5"), which did not incorporate a drought contingency provision, resulted in the unprecedented depletion of available storage within the federal reservoirs in the ACF Basin. This depletion ultimately forced the Corps to implement its Exceptional Drought Operations ("EDO") plan in November of 2007. The Modified IOP incorporates several of the provisions from the EDO, and those provisions, at the very least, should remain in the Modified IOP.

One of the drought contingency provisions that the Corps built into the Modified IOP is the increased emphasis on system storage. IOP 5 prescribed reservoir release rules that were not dependent upon or otherwise tied to the amount of available water remaining in conservation storage within the Basin. Under the Modified IOP, reservoir release and storage rules would be based in part upon the amount of water in the Corps' ACF reservoirs. The Modified IOP also reduces some of the release thresholds in IOP 5, increases the percentage of basin inflow that may be stored at certain times of the year, and provides for a "re-fill period" from December through February, in which all flows above 5,000 cubic feet per second ("cfs") that are available for capture may be stored in the system. These changes are all necessary to help mitigate some of the potentially harmful effects of the IOP.

The Modified IOP also allows for the possibility of reducing releases from Jim Woodruff Dam to the Apalachicola River as measured at the Chattahoochee gage to levels below 5,000 cfs. Maintaining a flow of 5,000 cfs in the Apalachicola River during dry times can expend a vast amount of water. In 2007, augmentation by the Corps to maintain a 5,000 cfs minimum resulted in a loss of roughly 850,000 acre-feet of storage throughout the ACF system. When the Corps implemented the EDO in November of 2007, only 33% of all conservation storage within the system remained. The Corps' operating plans should always maintain the ability to reduce flow below 5,000 cfs during serious and prolonged droughts.

Continued Concerns about the IOP

While the Modified IOP is an improvement upon some aspects of IOP 5, there are still several provisions of the Modified IOP to which Georgia is opposed.

Storage/Release Thresholds

Of continued concern are certain of the threshold levels for storage/release at various composite storage zones and times of the year.

One of these is in Composite Storage Zones 1 and 2 during the Gulf sturgeon spawning season. Under the Modified IOP, from March through May, when Composite Storage is in Zones 1 and 2, the Corps would be unable to store water in the system until Basin Inflow exceeds 16,000 cfs. Based upon the best scientific and technical information of which we are aware, maintaining a flow of 16,000 cfs, when water otherwise might be added to composite storage for use in the drier parts of the year, appears to be unnecessary and wasteful.

There is no evidence showing that the success of Gulf sturgeon spawning varies according to the amount of spawning habitat below Jim Woodruff Dam. Even if there were, there is no evidence to suggest that the amount of habitat inundated at a flow of 16,000 cfs is optimal or even preferable to lower flows. Figure 3.6.1.4.C on page 104 of the United States Fish and Wildlife Service's (FWS') September 2006 Biological Opinion on the IOP depicts the acres of spawning habitat available under a range of flow conditions at the two known Gulf sturgeon spawning sites on the Apalachicola River. The figure shows that, at these two sites, the total amount of available spawning habitat increases as flows increase from 5,000 to 10,000 cfs. However, the amount of available spawning habitat then levels out for flows ranging from 11,000 cfs to approximately 20,000, rising only slightly around a flow of 14,000 cfs. As indicated in the figure, there appears to be little difference in the habitat available at 11,000 cfs and the amount available at 16,000 cfs. Furthermore, in its September 2006 Biological Opinion, FWS pointed out that, in 2005 and 2006, Gulf sturgeon spawned at the same location "under very different flow conditions," and that "sturgeon used higher portions of the rock shoal in 2005 when flow was higher, and lower portions in 2006 when flow was lower." Georgia has demonstrated that, in 2006, spawning activities for the Gulf sturgeon occurred at flows in the range of 12,000 - 13,000 cfs. (*See* Fig. 1). The Corps and FWS should consider the best available science and data in revising the 16,000 cfs threshold with a lower number that will both benefit the Gulf sturgeon and provide adequate opportunities to increase storage in the ACF system.

Georgia also remains concerned that the Modified IOP does not allow any storage to occur when Basin Inflow is between 5,000 and 8,000 cfs during the period of June through November when the ACF reservoirs are in Zones 1, 2, or 3. The Corps and FWS should build into the Modified IOP opportunity for storage under these conditions, particularly as composite storage falls towards and into Zone 3. This could result in more optimal conditions for the reservoirs and for the species during or heading into serious droughts. The period between June and November usually is the driest time of the year. This is especially so in the drought years.

The Modified IOP calls for the release of the entire amount of Basin Inflow when it is within the range between 5,000 and 8,000 cfs in this period. The effect of this provision in a drought year is to have a flow generally at the 5,000 cfs level with sporadic flow increases toward 8,000 cfs that cannot be sustained past the short-lived increase in Basin Inflow. There is little scientific evidence indicating that such a flow regime is superior to a sustained 5,000 cfs flow in terms of protecting the endangered species. Intuitively, these sporadic spikes in flow may induce the mussels to move to higher ground, only to be stranded later when Basin Inflow drops back to a lower level.

Ramping Rate Restrictions

Another troubling aspect of the Modified IOP that the Corps has carried over from previous versions of the IOP is the ramping rate limitation. The Modified IOP prohibits the daily stage decline on the Apalachicola River at the Chattahoochee gage from exceeding certain limits. It is Georgia's understanding that the purpose of these ramping restrictions is to provide a stage decline rate on the River that replicates natural conditions and is protective of the threatened and endangered species in the Apalachicola River. The provisions in the Modified IOP call for a maximum daily fall rate of 1.0 to 2.0 feet when flow of the previous day is between 20,000 and 30,000 cfs, a maximum daily fall rate of 0.5 to 1.0 feet when flow is between 16,000 and 20,000 cfs, a maximum daily fall rate of 0.25 to 0.5 feet when flow is between 8,000 and 16,000 cfs, and a maximum daily fall rate of 0.25 feet when flow is less than 8,000 cfs. In practice, the Corps usually chooses to use the more stringent values in each flow group.

The Modified IOP's ramping limitations are more restrictive than actual fall rates that have occurred on the Apalachicola River under natural flow conditions. To analyze ramping rates that have occurred in nature on the Apalachicola River, Georgia compiled stream flow and gage height data for the Chattahoochee gage for the period between 1928 and 1955. This is a period prior to the operation of any of the current federal reservoirs on the ACF Basin and can be considered a period of "natural" flow. We calculated the actual daily stage decline in this period, grouped these data according to the flow rate and the Corps' thresholds for determining ramp rates, and developed exceedance levels of these natural stage declines. As shown in the attached Figures 2 through 5, there is a great deal of variety within these natural flow rate declines, but, during the period referenced, natural flow often declined more rapidly than what is allowed under the IOP. Figure 2 demonstrates that, for the flow range between 20,000 and 30,000 cfs, 30% of the time under natural conditions, the fall rate was greater than 1.0 foot per day, and 12% of the time, natural flows exceeded 2.0 feet per day. The differences between "natural" ramp-down and the ramp-down imposed under the Modified IOP become more pronounced as the Basin Inflow decreases. As shown in Figure 4, during the period referenced, when flows were between 8,000 and 16,000 cfs, half of the time the natural fall rate was greater than .25 feet per day, and 22% of the time was greater than 0.5 feet per day.

As clearly demonstrated by this analysis, the ramp-down rates established under the Modified IOP often greatly exceed the rates experienced in nature. There is no scientific evidence establishing a biological need for these extreme restrictions. The only purpose served by these ramp-down restrictions is to needlessly waste additional conservation storage.

Failure to Account for and Offset Over-Releases

Due to constraints such as the ramp-down restrictions discussed above, operational imprecision, and head-difference limitations, the Corps has, as a practical matter, been unable to make releases from Jim Woodruff Dam in the same manner as what is called for under prior versions of the IOP. Typically, the Corps releases more water than is necessary to ensure that all flow targets are met. As an example, Figure 6 shows that, throughout the summer and fall of 2007, when the flow target remained at 5,000 cfs, the Corps maintained a minimum flow of greater than 5,100 cfs during this period. Even under EDO operations, when the flow requirement was 4,750 cfs, the Corps had to make releases of around 5,000 cfs due to head difference limitations. In addition to resulting in unanticipated losses of water, these over-releases of water are wholly or largely unaccounted for in the Corps modeling of the IOP and therefore undermine the effectiveness of the models as predictive tools.

The Corps has previously suggested that a mass balance procedure be established to account for the accumulated over-releases and provide an overall correction to system storage by allowing releases less than those required under appropriate circumstances to offset over-releases. The Corps' past mass balancing procedure was inadequate because it rarely would allow for offsetting of over-releases, particularly in drier times. We have noted that the Modified IOP does not appear to contain any mechanism to account for and offset over-releases, and we are concerned that the impact of such over-releases has been ignored in the Corps' evaluation of the Modified IOP. To avoid unplanned and detrimental losses of water from the ACF Basin reservoir system, Georgia requests that the Corps institute a system to track and correct for over-releases under the Modified IOP.

Needed Reduction in Peaking Hydropower Production

Georgia further suggests that, in order to mitigate other aspects of the IOP and preserve much needed storage in the ACF headwaters, the Corps should reduce the amount of peaking hydropower generation at Lake Lanier. The Corps has previously stated that the amount of peaking hydropower generation is determined by action zones at Lake Lanier. A total of three hours of peaking power generation are typically scheduled for Zone 1, while 2 hours are scheduled for Zones 2 and 3. Peaking power generation, which results in higher daily average flow out of Lanier, imposes an additional burden on Lake Lanier. For example, three-hours of peaking generation can cause a release from Lanier that constitutes about 30% of a 5,000 cfs release from Jim Woodruff Dam. A three-hour peaking generation and a continuous release of 450 cfs by the house unit results in a daily average flow of approximately 1,400 to 1,650 cfs. A two-hour peaking generation results in a daily average flow of approximately 1,100 to 1,250 cfs.

As demonstrated this year, it is much more difficult to refill the headwater reservoir of a river system than it is to refill the lower projects. Reducing the amount of peaking power generation from Lake Lanier is certainly a way of keeping more storage in the headwater reservoir.

<u>Comments of Florida DEP</u>

Georgia has reviewed the April 30, 2008 letter to you from the Florida Department of Environmental Protection ("FDEP") concerning the Modified IOP. That letter contains a number of spurious claims concerning the purported effect of the IOP and the Modified IOP upon the Gulf sturgeon spawn, federally protected mussels, and the salinity of Apalachicola Bay. The foregoing comments respond to many of the FDEP assertions, but I would like to provide additional responses to the claims regarding the IOP's effects on salinity in Apalachicola Bay.

The FDEP letter presented a series of charts comparing observed flow in the Apalachicola River with salinity measurements taken in Apalachicola Bay. FDEP appears to suggest that elevated salinity levels in Apalachicola Bay are the direct result of the Corps' operations under the IOP and that these salinity levels may pose a risk to juvenile Gulf sturgeon. The data provided by FDEP does not give an accurate estimate of salinity at the mouth of the Apalachicola River and, therefore, cannot be used to insinuate that salinity levels at the mouth of the river could pose a threat to juvenile Gulf sturgeon. In fact, as shown in Exhibit A of FDEP's letter, the three locations at which salinity data were taken all are six to seven miles from the mouth of the Apalachicola River. The values presented by FDEP cannot be used to predict salinity conditions over six miles away. As demonstrated by prior studies on this topic, spatial variation of salinity in the Apalachicola Bay can range from less than 2 parts per thousand ("ppt") near the mouth of the River to as high as 32 ppt near the East Pass under 1993 hydrologic conditions. *See* Wenrui Huang, William K. Jones & Jerrick Saquibal, *Three-dimensional Modeling of Circulation and Salinity for the Low River Flow Season in Apalachicola Bay, FL*, Water Resources Special Report 97-1, Figures 3.5.1a-3.5.4b (1998).

Furthermore, as shown in the Figure 7, weather conditions in 1993 were much wetter than conditions experienced in 2007. Even given the relatively abundant flows experienced in 1993, these higher flows were not able to prevent salinity in the Bay from reaching above 30 ppt. (*See* Huang, pp. 52-57). The difference in fresh-water input to the Apalachicola Bay between 1993 and 2007 (June though November period) equates to approximately 2.25 million acre-feet. The entire amount of conservation storage in the ACF Basin is only 1.64 million acre-feet. Even if the Corps had emptied the entire available storage from the ACF system in 2007, the fresh-water input would not have matched that of 1993 and would have been a futile attempt at lowering the salinity several miles out into the Bay.

FDEP also fails to note that wind near the surface of the Bay plays an important role in the salinity conditions. A prior study found that a fifteen mile per hour wind in the east-west direction could induce an inflow of salt-water into the Bay at a rate of 70,620 cfs. *See* Wenrui Huang, William K. Jones & T.S. Wu, *Modeling Wind on Subtidal Salinity in Apalachicola Bay, Florida,* Estuarine, Coastal and Shelf Science, Vol. 55, pp. 33-46 (2002). This magnitude of salt-water inflow into the Bay would be certain to overwhelm any freshwater input from the Apalachicola River, particularly in a drought year.

Contrary to FDEP's assertion that the Corps' operations under the IOP have resulted in an increase in salinity in the Apalachicola Bay, the IOP has actually provided flows into the Bay greatly exceeding the amount of fresh water that would have otherwise entered into the ACF system during back-to-back years of extreme drought. The original IOP contained provisions that prevented the Corps from storing water in the wet seasons and that required flow augmentation in the dry seasons. As a result of these practices, the Corps has used large amounts of storage from the ACF system to augment flows while storing little. Consequently, as shown in Figure 8, the Composite Storage in the ACF has been in a steady decline for the past two years. As shown in Figure 9, in 2007, Basin Inflow was as low as 2,000 to 3,000 cfs for several months. The total amount of storage used to augment flows during this period amounted to over 50% of the conservation storage for the entire system.

FDEP's assertions ignore the fact that, during periods of flow augmentation, Lake Lanier in particular provides a disproportionate amount of that augmentation as compared to its drainage basin. Lake Lanier holds two thirds of the system conservation storage, and yet has a drainage area of only 1,040 square miles. This small contributing drainage area is only 6% of the entire drainage area upstream of Jim Woodruff Dam (17,200 square miles). As a result, it is very difficult to refill Lake Lanier once storage has been depleted to the severe degree seen in 2007. In 2008, all of the ACF storage reservoirs except for Lanier restored conservation storage and refilled to summer pool levels. Lake Lanier was unable to refill in spite of the EDO provisions that allow storage of Basin Inflow above 5,000 cfs. Because most of the Basin Inflow took place below Buford Dam, the Corps was unable to take full advantage of the EDO provisions to refill Lake Lanier. The Corps operates Lanier to provide water supply to much of the Metropolitan Atlanta area and to provide water quality protection in the Chattahoochee River. The 750 cfs flow that the Corps historically has maintained is 15% of a 5,000 cfs flow in the Apalachicola River at the Chattahoochee gage (and 17% of 4,500 cfs). A minimum flow of 650 cfs is 15% of a 5,000 flow. By providing the minimum flow required at Peachtree Creek confluence, Lake Lanier already contributes a larger share of the flow at Jim Woodruff Dam than its drainage proportion.

The FDEP letter provides no legitimate facts or data indicating that the IOP has, nor that the Modified IOP will, be the cause of significant harm to the Apalachicola River and Bay. The Corps and FWS have attempted in the IOP to mitigate the effects of low flow on the protected species in the ACF Basin. Georgia believes that the scientific data and experience of the past two years indicates that, if anything, the Corps has released water from the ACF Basin at levels that are unnecessary and even in some respects detrimental to the continued existence and recovery of the species. Moreover, the IOP, and even more so the flows that FDEP requests, are unsustainable and would cause grave harm to those who rely on the waters of the ACF Basin in Georgia. Finally, FDEP's suggestion that the Corps should continue to make releases from Lake Lanier down to an elevation of 1035 feet to augment flows in the Apalachicola River cannot be given serious consideration. To operate a headwaters reservoir of Lanier's size and limited drainage area as FDEP suggests would jeopardize water supply and water quality for millions of Georgians, and, by virtually ensuring that Lake Lanier would remain or fall below the bottom of conservation storage in the months and even years that would follow, would put at risk of irreparable harm needs of the people and natural resources that rely on flows in the ACF Basin.

I appreciate the opportunity to provide you with these comments and ask that you give them careful consideration. If I may provide any additional information that would be helpful to you in your consideration of the Modified IOP, please let me know.

Sincerely yours,

Carol Couch, Director
Georgia Environmental Protection Division

cc: Brig. Gen. Joseph Schroedel, South Atlantic Division Commander, U.S. Army Corps of Engineers
Colonel Byron Jorns, District Commander, U.S. Army Corps of Engineers, Mobile District
Mr. Chuck Sumner, Inland Environment Team, U.S. Army Corps of Engineers, Mobile District

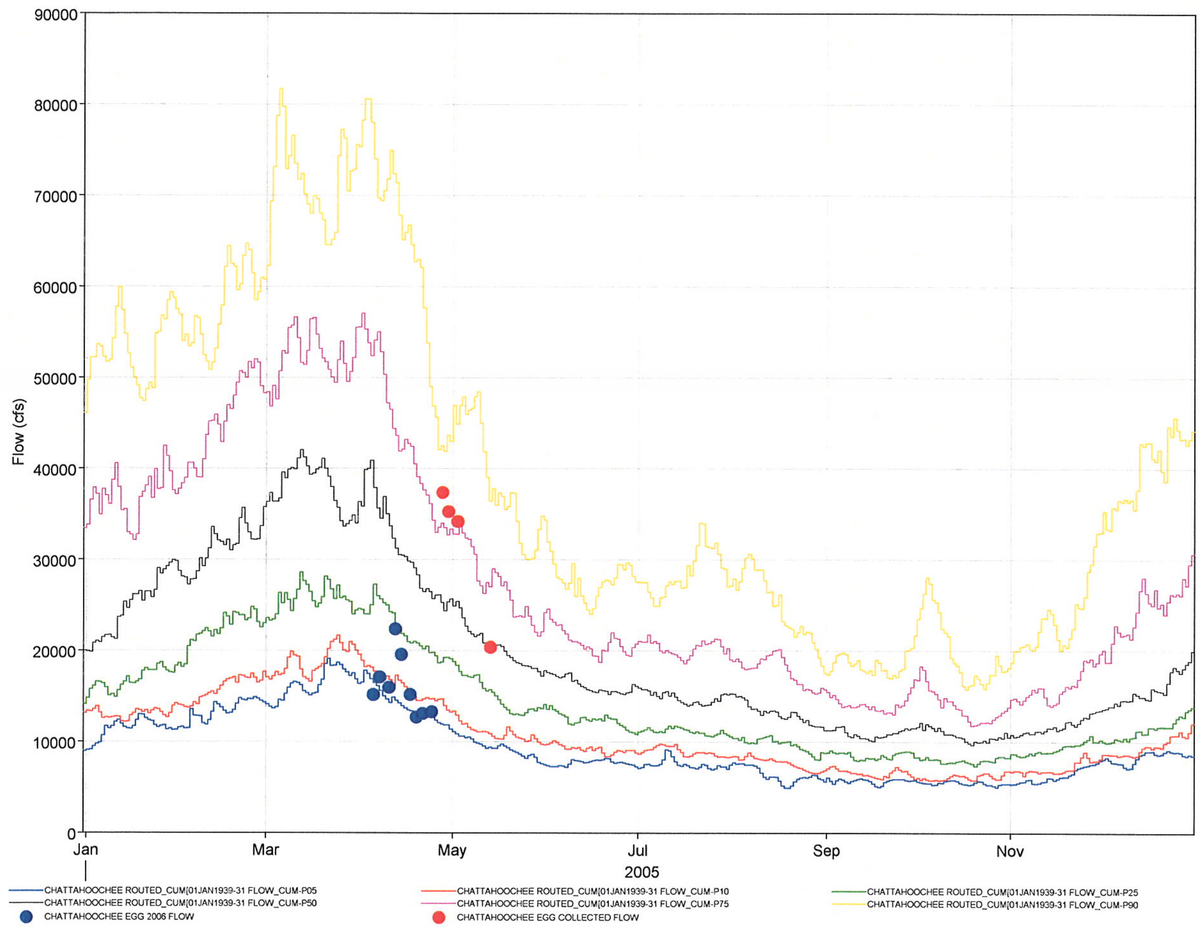

Fig. 1 Flow rates corresponding to Gulf Sturgeon egg collection in 2005 (red dots) and 2006 (blue dots) overlapped with non-exceedance flow levels (blue – 5%, red – 10%, green – 25%, black – 50%, magenta – 75%, yellow – 90%)

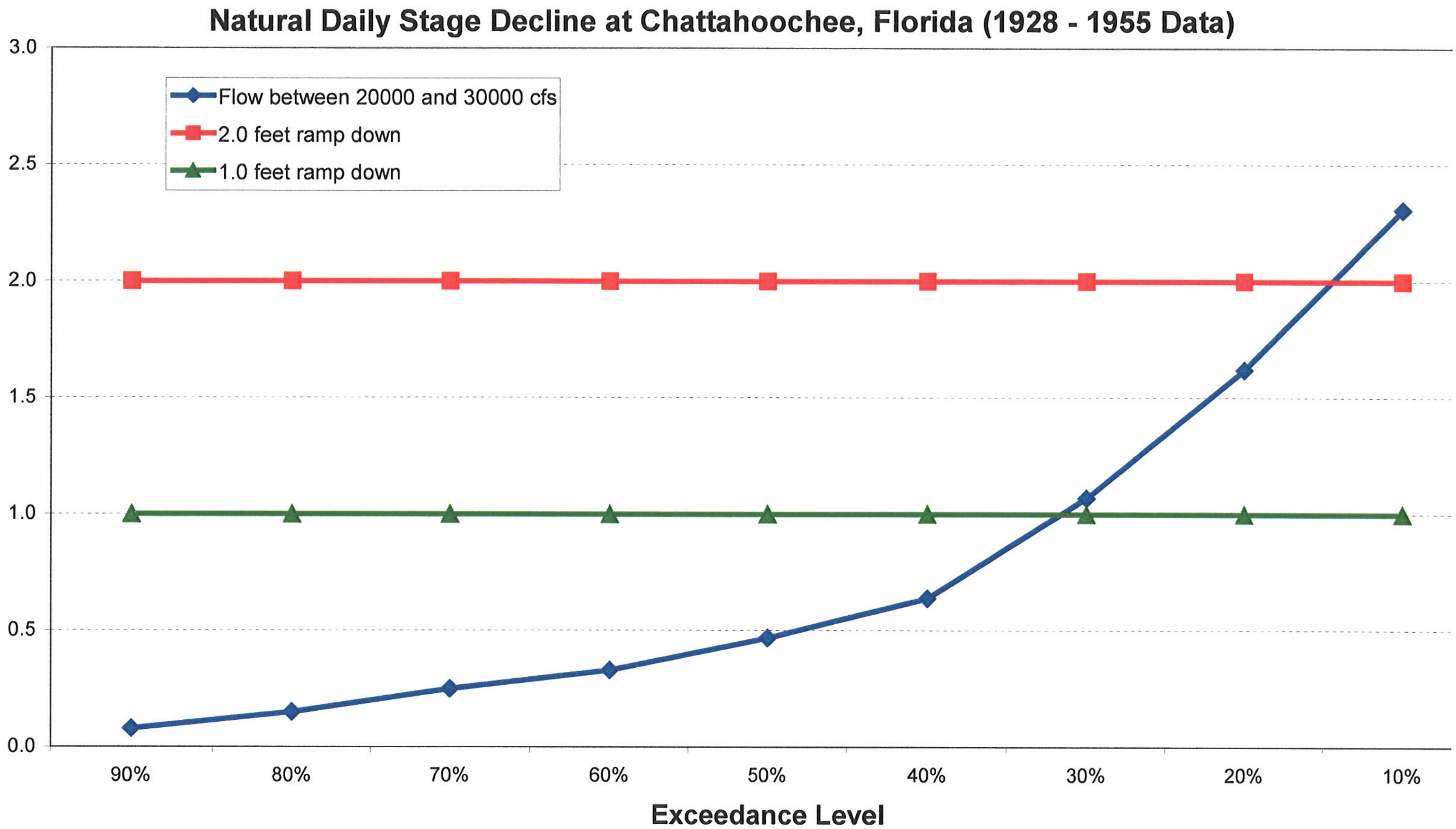

Fig. 2 Natural stage decline at Chattahoochee, Florida in comparison to the arbitrary ramping rates in the MIOP (Flow between 20000 and 30000 cfs)

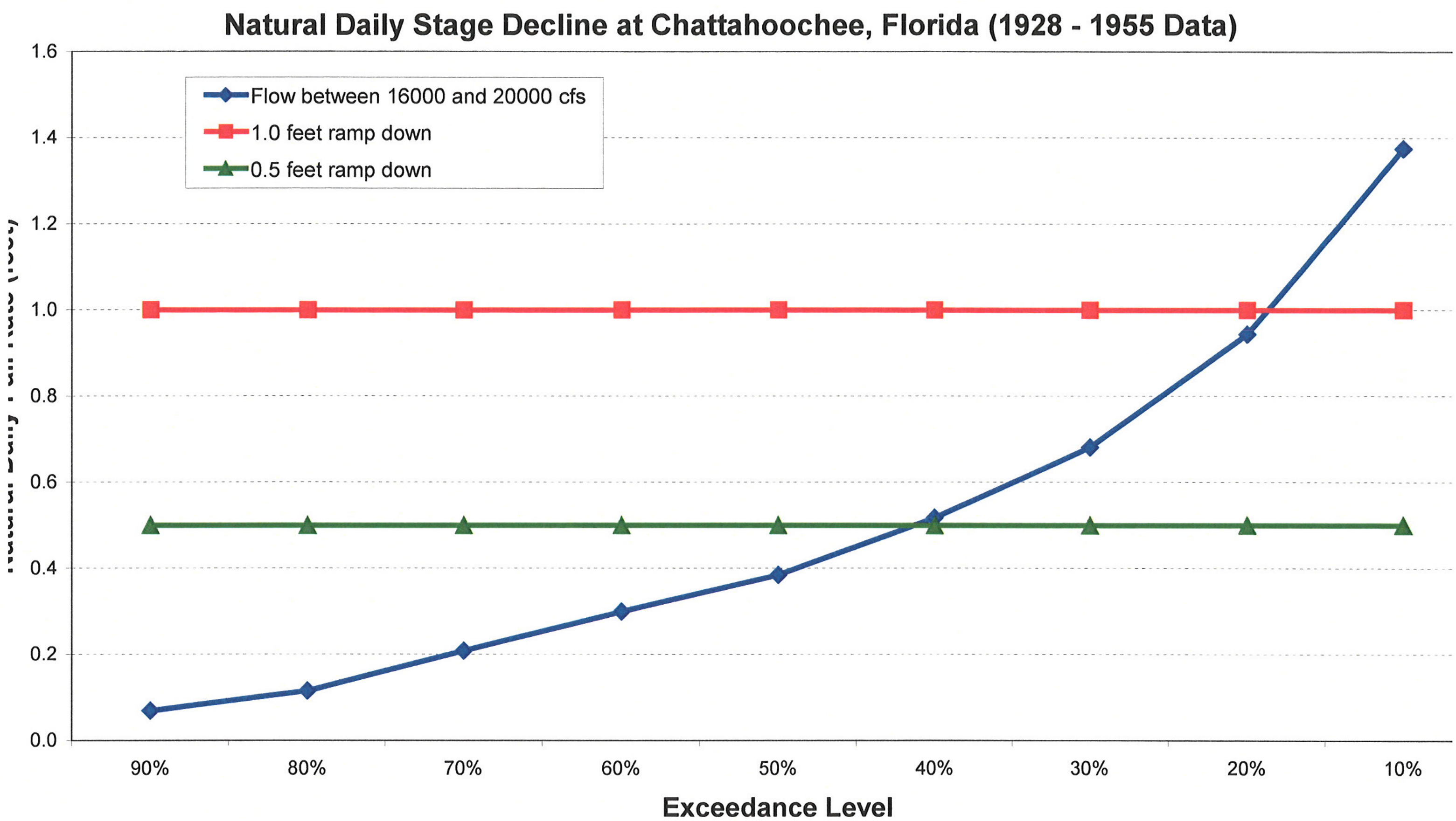

Fig. 3 Natural stage decline at Chattahoochee, Florida in comparison to the arbitrary ramping rates in the MIOP (Flow between 16000 and 20000 cfs)

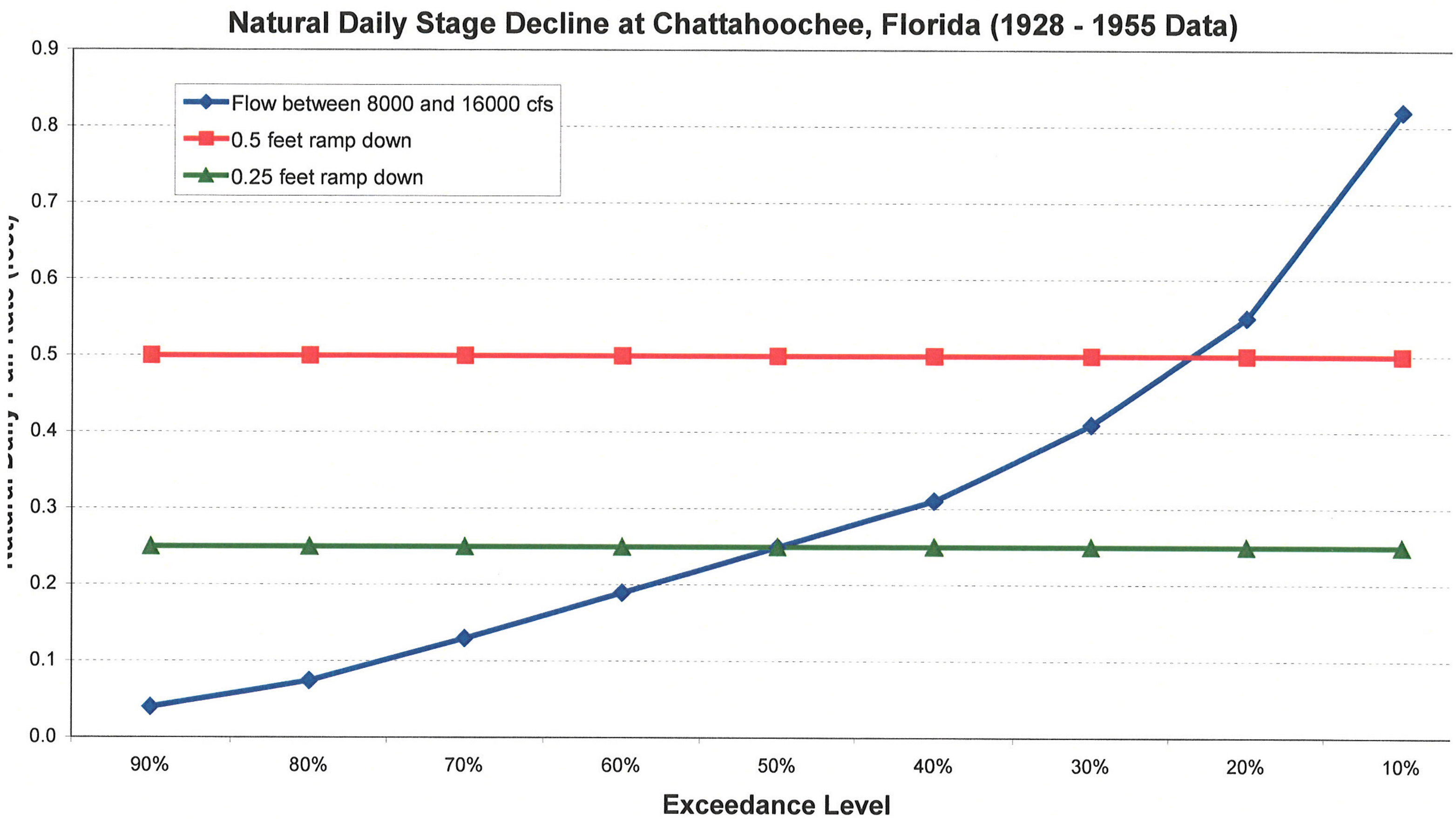

Fig. 4 Natural stage decline at Chattahoochee, Florida in comparison to the arbitrary ramping rates in the MIOP (Flow between 8000 and 16000 cfs)

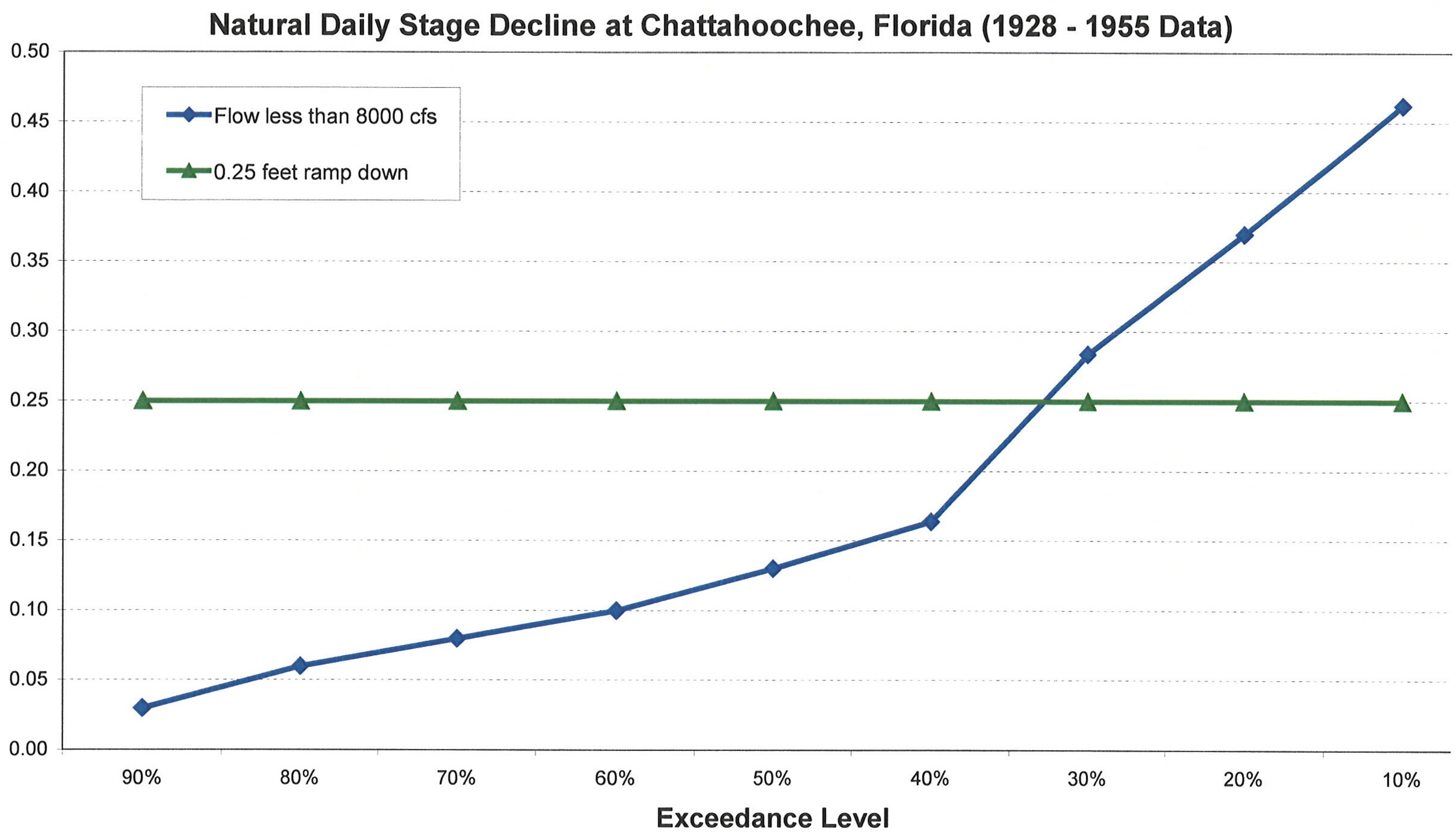

Fig. 5 Natural stage decline at Chattahoochee, Florida in comparison to the arbitrary ramping rates in the MIOP (Flow less than 8000 cfs)

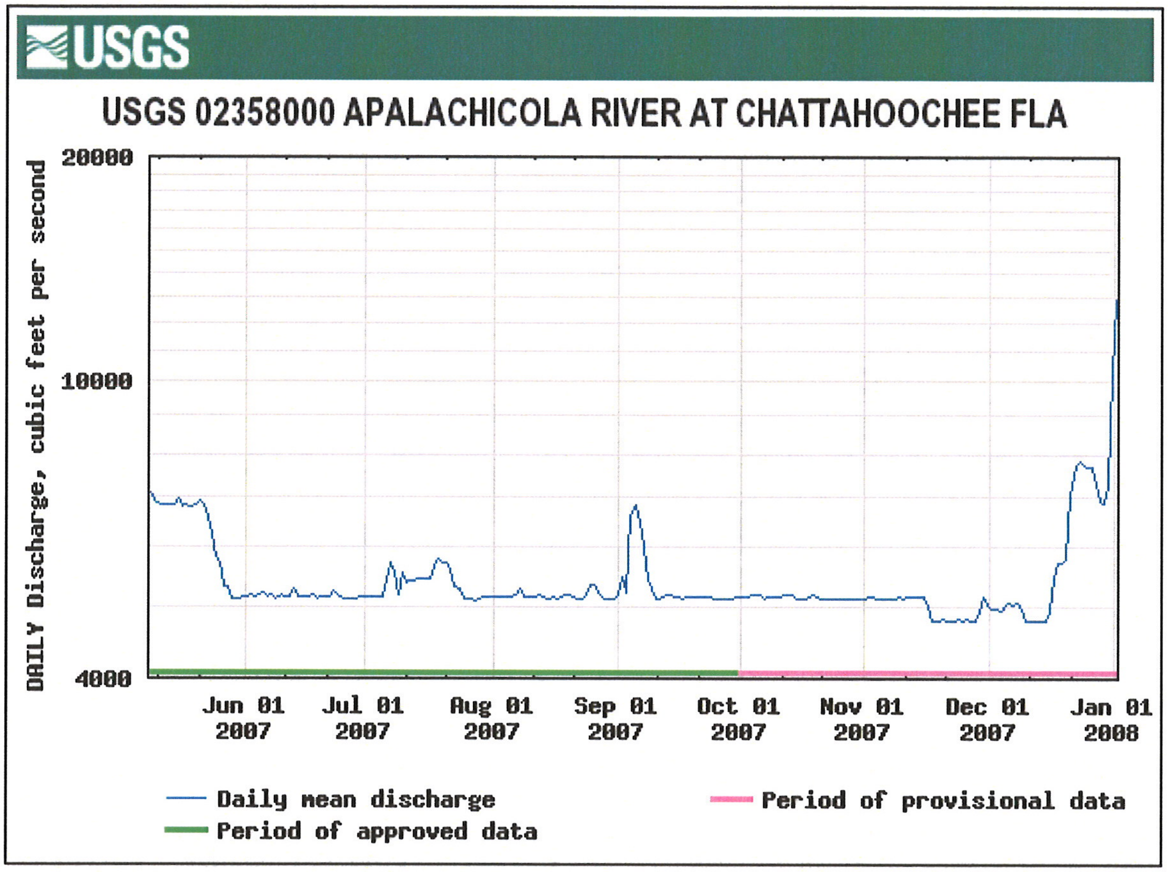

Fig. 6 Flow observed at Apalachicola River at Chattahoochee, Florida in 2007

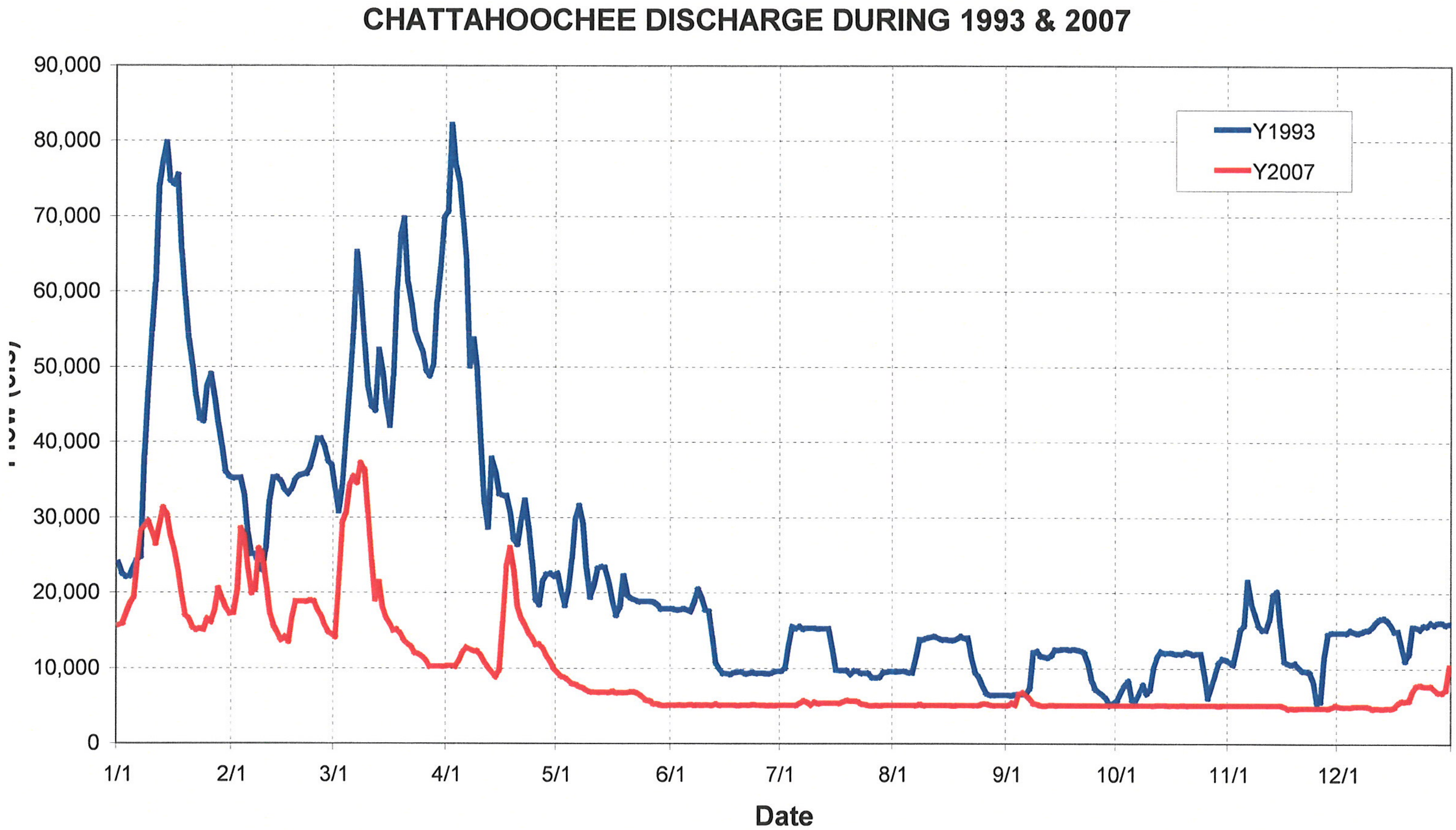

Fig. 7 Hydrologic conditions in years 1993 and 2007

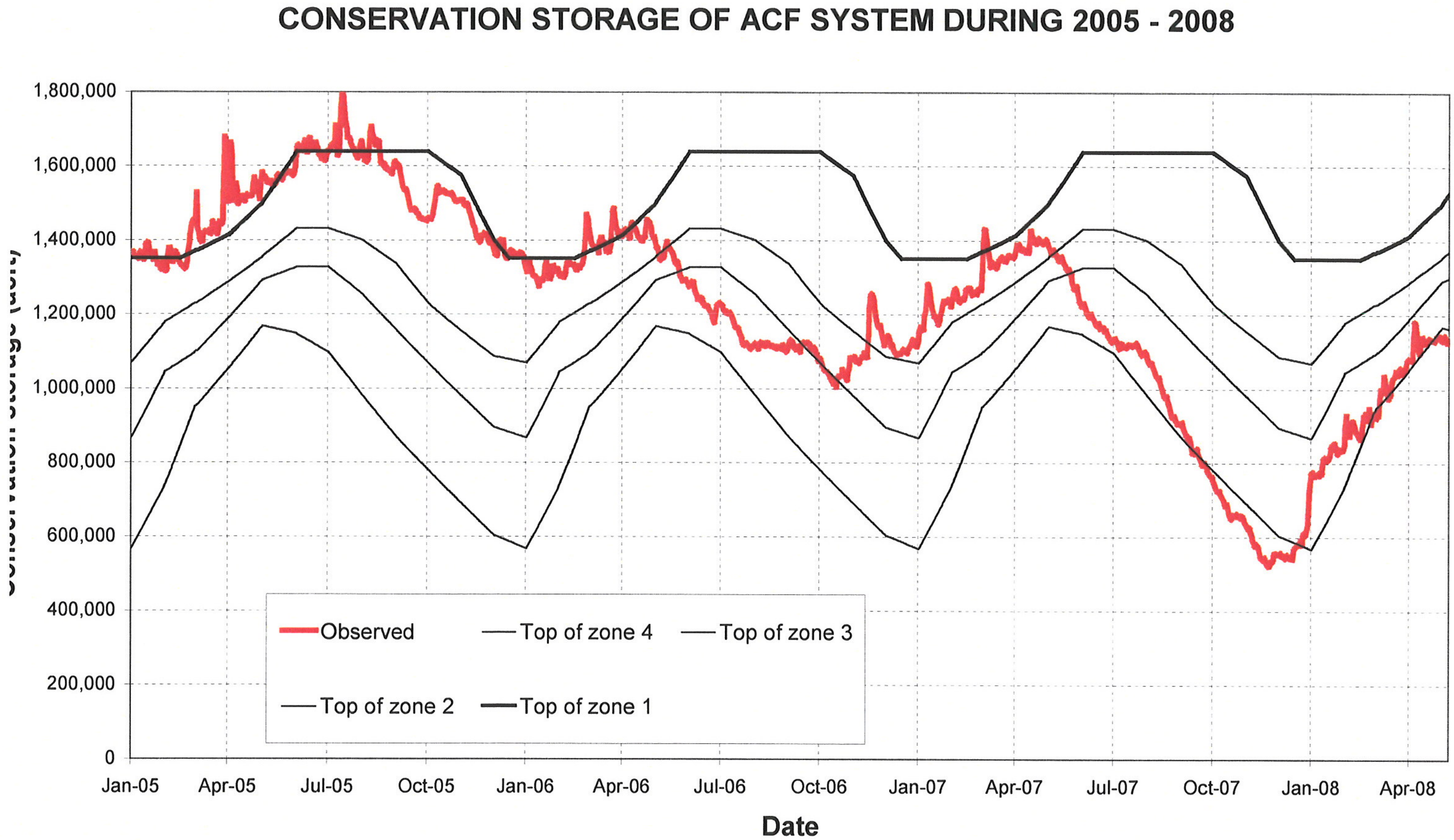

Fig. 8 The decline of ACF conservation storage from 2005 to 2008

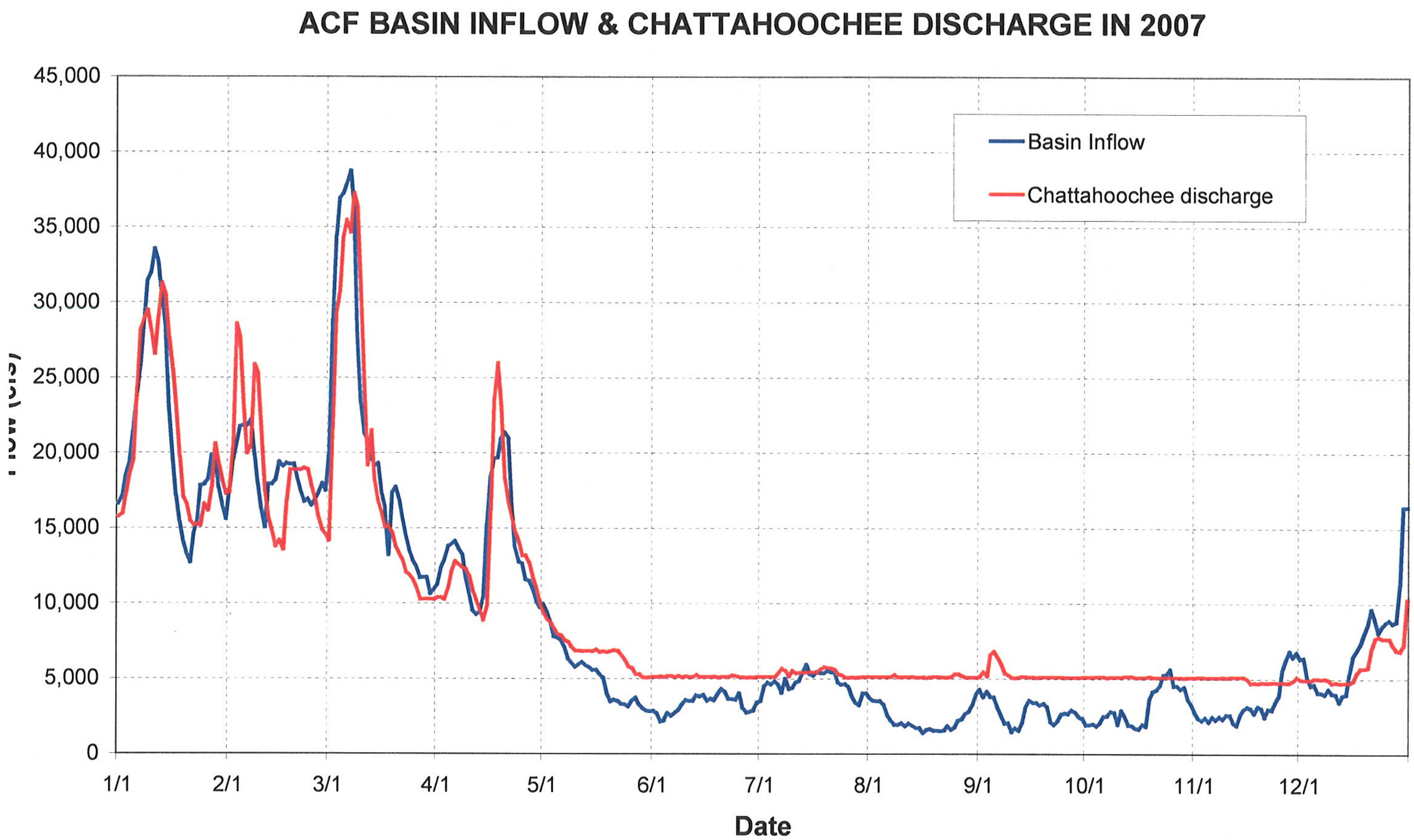

Fig. 9 ACF Basin Inflow and Measured flow at Apalachicola River at Chattahoochee, Florida in 2007

Florida Department of
Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

May 15, 2008

Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Ave.
Panama City, FL 32405-3721

RE: ESA Section 7 Consultation on Proposed Revision to the Interim Operations Plan

Dear Ms. Carmody:

Enclosed is a letter that I am forwarding from Douglas E. Barr, Executive Director of the Northwest Florida Water Management District. Mr. Barr's letter addresses a series of flaws in the U.S. Army Corps of Engineers' ("Corps") discretionary actions under the Interim Operations Plan ("IOP"). These flaws are perpetuated in the Corps' proposed revision to the IOP ("Revised IOP") as articulated on April 15, 2008.

As the letter explains, through retroactive application of highly problematic accounting, the Corps has effectively rendered the IOP's minimum flow requirements meaningless. The Revised IOP will allow the Corps to reduce and maintain River flows at unprecedented levels and exacerbate the damage inflicted on the Apalachicola River and Bay ecosystem.

The State of Florida believes that the Corps continues to ignore the impact of upstream depletions on its ability to meet downstream flow requirements. Some of these depletions are referenced in the enclosed letter from Mr. Barr. The Fish and Wildlife Service has not addressed the cumulative impact of increasing depletions. In addition to those mentioned by Mr. Barr, and others well-known to you, this week, Georgia has enacted a Water Conservation and Drought Relief Act of 2008, which is designed to facilitate construction of new reservoirs in Georgia. Additional upstream depletions are thus certain to occur, and must be acknowledged during the ongoing consultation. *See* 50 CFR § 402.14(g)(3). Specifically, when determining whether the Revised IOP will "jeopardize" species or "adversely modify" their critical habits, your agency must account for the fact that increasing upstream depletions result in lower "Basin Inflow" calculations and corresponding reductions in outflow from Jim Woodruff Dam under the Revised IOP. Additional mitigation may be required to offset the impact of the Revised IOP when "taken together with" upstream depletions. 50 CFR § 402.14(g)(4).

Please consider Mr. Barr's letter a supplement to the comments in my letter of April 30, 2008. The State of Florida urges you to address these in the ongoing consultation and asks that the anticipated biological opinion clearly articulate the operations, and potential additional mitigation measures, required of the Corps in order to avoid a violation of the Endangered Species Act.

Sincerely,

Michael W. Sole
Secretary

Enclosure

cc: The Honorable Dirk Kempthorne, Secretary, U.S. Department of Interior
Mr. Dale Hall, Director, U.S. Fish and Wildlife Service
Mr. Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service
Tom Beason, General Counsel, Florida Department Environmental Protection
Colonel Byron Jorns, District Commander, U.S. Army Corps of Engineers
Ms. Carol A. Couch, Director, Environmental Protection Division, Georgia Department Natural Resources
Mr. Trey Glenn, Director, Alabama Department Environmental Management

Northwest Florida Water Management District

81 Water Management Drive, Havana, Florida 32333-4712
(U.S. Highway 90, 10 miles west of Tallahassee)

(850) 539-5999 • (Fax) 539-2777

Douglas E. Barr
Executive Director

May 12, 2008

Mr. Michael Sole, Secretary
Florida Department of Environmental Protection
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

RE: COE Performance Under the "Interim Operations Plan" and Concerns with the "Proposed Modification to the Interim Operations Plan for Jim Woodruff Dam"

Dear Secretary Sole:

On April 15, 2008 the COE proposed its "Modification to the Interim Operations Plan at Jim Woodruff Dam" (Modified IOP). Related to this, I was also recently provided with a copy of a letter dated November 6, 2007 from Curtis M. Flakes, Mobile District Corps of Engineers (COE) to Gail Carmody, Panama City Field Office of the U.S. Fish and Wildlife Service (FWS) with review comments on Florida's letter of August 2, 2007 regarding the accounting procedures used by the COE for determining compliance with the releases to the Apalachicola River under the Interim Operations Plan (IOP).

Without exception, all changes in the release requirements under the Modified IOP result in less flow to Apalachicola River in comparison to the original IOP. The problems and shortcomings of the original IOP as previously identified by Florida, therefore, are significantly magnified under the Modified IOP. The November 6, 2007 letter is the last in a sequence of correspondence among the COE, FWS and Florida regarding documented instances in which minimum releases required by the IOP were not met, the procedures used to account for "storage credits" under the so-called Volumetric Accounting provisions of the IOP, and the ease with which these have been changed and/or the credit balance modified. As outlined below, the November 6, 2007 letter leaves Florida with no objective means of independently determining compliance with minimum release requirements called for in the IOP (or the proposed Modified IOP, for that matter). At this juncture, therefore, I can conclude only that: 1) the releases for the Apalachicola River are further reduced under the Modified IOP from the already inadequate levels provided under the original IOP, and 2) that compliance with the IOP's minimum release requirements and accounting provisions has become progressively more subjective and dependent on the exercise of vaguely defined COE "discretion" to extent that even the minimum releases to Apalachicola River are not assured.

Inadequacies of Original IOP

The original IOP was based on the flawed determination that a 5,000 cfs minimum release to Apalachicola River is adequate to protect federally threatened and endangered species. This misconception must be corrected to avoid permanent damage to the ecosystem and biota of Apalachicola River and Bay. In regard to the original IOP, Florida raised a number of objections. An abbreviated description of these is provided below.

1. In February 2007, Florida notified the FWS that even under past hydrologic conditions the IOP would result in a much higher frequency and duration of flows at the minimum level of 5,000 cfs than has been experienced at any time in the past. In an unsuccessful effort to provide for higher flows, the federal agencies added a provision to the IOP (known as RPM 3) setting a "desired" release to Apalachicola River of 6,500 cfs when the composite storage in Lake Lanier, West Point Lake and Lake Walter F. George was in zones 1 or 2. This provision had little practical impact, and the 6,500 cfs desired flow was eliminated by the COE in the Modified IOP.

2. Water held in storage in Lake Lanier, West Point Lake and Lake Walter F. George is never used to support flows to Apalachicola River. At most, releases to the Apalachicola River are capped at basin inflow or some percentage of basin inflow at all times of year and regardless of elevation of the reservoirs or the volume of water held in storage in the reservoirs (individually or collectively). Under the original IOP, the only exception was when basin inflow fell to less than 5,000 cfs. Only under this extreme low flow, therefore, were the reservoirs to be used to support inflows to Apalachicola River. This is true regardless of the impact falling basin inflow might have had on threatened and endangered species and critical habitats.

3. The COE methodology for computing basin inflow (BI), as approved by the FWS, apportions the basin inflow AFTER 100% of all Georgia consumptive demands in the basin have been met. Even on a proportional basis, Florida never receives the benefit of the actual basin inflow, but rather only receives that portion of the basin inflow that remains after all Georgia withdrawals and needs have been satisfied. Even during extreme droughts when releases to Apalachicola River are at record lows, the COE methodology ensures that 100% of Georgia consumptive demands from the Chattahoochee River and Flint River are met without limitation. Further, the methodology ensures that all future increases in Georgia demands are met without constraint before the remaining basin inflow is allocated as provided in Jim Woodruff Dam release schedule.

4. In 2006, the COE changed the measuring point for determining releases to Apalachicola River. Previously, releases had been measured based on the discharge from Jim Woodruff Dam. In 2006, the COE began using the U.S. Geological Survey gage located downstream of the dam at Chattahoochee. Some measure of the combined impact of these provisions and operational changes can be made by comparing the minimum releases during the 2007 drought (post-IOP) to the minimum releases during the 2000 drought (pre-IOP). In 2000, continuous low flows occurred over a period of approximately 5 months. During this period the Woodruff releases were used as the point of measurement for the minimum flow of 5,000 cfs and the actual releases averaged 5,190 cfs.

During this same period the Chattahoochee gage flow averaged 5,530 cfs. During the 2007 drought, there was a period of approximately 5.5 months during which the minimum release requirement under the IOP was 5,000 cfs. During this period the Woodruff release averaged 4,770 cfs and the Chattahoochee gage flow averaged 5,190 cfs. The impact of the change in measuring point, therefore, was a reduction in releases of 340 to 420 cfs depending on whether the Woodruff release or the gage flow is used to determine the loss. For approximately one month near the end of 2007, the minimum required flow was reduced to 4,750 cfs. During this period the gage flow averaged 4,860 cfs and the Woodruff releases averaged 4,460 cfs. In 2007, therefore, the combined impact to the change in measuring point and reduction of the minimum flow requirement was a decline of 670 cfs (based on gage) to 730 cfs (based on Woodruff release) in comparison to the 2000 drought.

As outlined above, the original IOP was obviously biased towards retaining water in reservoir storage to the detriment of releases to Apalachicola River. Further, the failure to account for consumptive withdrawals in the determination of the basin inflow clearly benefits upstream users to the detriment of releases to Apalachicola River. Finally, the change in the method of measuring outflow from Woodruff combined with the reduction of the release requirement to 4,750 cfs reduced the minimum required release by approximately 700 cfs in comparison to the 2000 minimum releases.

The April 15, 2008 Modified IOP

The Modified IOP includes several changes that will result in decreases in releases to the Apalachicola River while simultaneously increasing water retained in the federal reservoirs.

1. Under the Jim Woodruff Dam release schedule in the original IOP, at least 70% of the basin inflow was to be released to Apalachicola River for flows in the general range of 8,000 cfs to 39,000 cfs, depending on the time of year and composite reservoir storage zone. Under the Modified IOP this is reduced to 50% of the basin inflow. Therefore, flows to Apalachicola River will be reduced by up to 20% of the basin inflow under the Modified IOP in comparison to the original IOP.

2. The "desired" release of 6,500 cfs to the Apalachicola River that was added to the original IOP as part of RPM 3 has been removed in the Modified IOP.

3. The COE has added an "Exceptional Drought Trigger Zone" that allows the COE to cut the release to the Apalachicola River to 4,500 cfs as measured at the Chattahoochee gage. This reduces the minimum flow by an additional 250 cfs below the FWS approved levels in 2007. This along with the reduction associated with the change in the point of measurement of releases will result in a net reduction of up to 900 to 1,000 cfs in comparison to minimum continuous releases during the 2000 drought. As noted above, the average continuous minimum flow as measured at the Chattahoochee gage was on the order of 5,500 cfs (rounded). Under the Modified IOP, flows as measured at the Chattahoochee gage are set at a minimum of 4,500 cfs or approximately 1,000 cfs below the minimum continuous flows that actually occurred in 2000.

4. Based on the COE graph included in the Modified IOP materials, the new "Exceptional Drought Trigger Zone" in the Modified IOP is set at composite storage levels ranging from approximately 2.35M acre-feet of total storage (=550,000 acre-feet of active storage) in the winter to approximately 2.72M acre-feet (= 920,000 acre-feet of active storage) in April through June (inclusive). Under the Modified IOP, therefore, releases to Apalachicola River could be reduced to unprecedented minimums and durations during the spring spawning period even though composite storage in the reservoirs is at up to 60% of FULL conservation pool volumes.

5. Under the original IOP, releases during the spring spawning period occurred regardless of the level of composite storage. The modified IOP changes the required releases during the spawning period based on the level of composite storage.

Like the original IOP, the Modified IOP continues the practice of computing basin inflow without accounting for consumptive withdrawals in Georgia. In the context of the Modified IOP, therefore, consumptive demands are unconstrained. Further, Florida receives less basin inflow under the Modified IOP, the minimum releases to Apalachicola River is reduced, more water is retained in storage rather than released, releases for the spring spawning period are more constrained and the Chattahoochee gage will continue to be the point of measurement for releases with no adjustment for the loss of inflow to the Apalachicola River resulting from changing the measurement from the Woodruff Dam outflow to the Chattahoochee gage.

Minimum Flow Compliance and Accounting of Storage Credits

Recently I was provided with a copy of a letter dated November 6, 2007 from Curtis M. Flakes, Mobile District , COE to Gail Carmody, Panama City Field Office of the FWS with review comments on Florida's letter of August 2, 2007 regarding the accounting procedures used by the COE for determining compliance with the releases to the Apalachicola River required by the IOP. The letter of August 2, 2007 was signed by Janet Llewellyn of the Florida Department of Environmental Protection (FDEP), however, the letter and underlying analysis were prepared by me.

1. The subject letter addresses violations of the minimum release requirements required under RPM 3, which became effective on March 1, 2007. The sequence began when Florida observed that COE releases to the Apalachicola River were less than the IOP minimum for more than 20 days in March and April of 2007. These findings were provided to the COE and FWS by letter dated April 19, 2007 under your cover. Further, the under-releases ranged up to 3,000 cfs below the required levels under the IOP.

2. The COE and FWS have not disputed that the releases were below the IOP minimums. Instead, by letter dated May 16, 2007 to the FWS, the COE claimed storage credits that pre-dated the effective date of the IOP. According to the COE letter, storage credits had accumulated in a previously undisclosed "volumetric balancing account" since September 2006 (up to six months before the approved effective date of the IOP). This allowed the COE and FWS to ignore the more

than 20 violations of the IOP minimum flows in March and April 2007. Having claimed retroactive storage credits and used these to offset the violations, the COE and FWS then reset the volumetric balancing account to zero and "restarted the accounting" on May 1, 2007. At this relatively early juncture, therefore, the COE and FWS had created, added and subtracted storage credits as needed to circumvent the IOP requirements. Substantively, therefore, this nullified the minimum flows specified in the IOP. Obviously, these actions were to the detriment of Florida and the Apalachicola River and Bay.

3. Florida examined the basis for the retroactive credits claimed by the COE for the period from September 2006 to February 2007. Specifically, Florida applied the IOP criteria for storage credits to this period to determine if the retroactive credits were valid. This was based on the assumption that the COE and FWS would surely apply all the IOP balancing and minimum flow requirements to the subject time period to ensure that Florida and specifically the Apalachicola River and Bay received both the benefits and adversity of the IOP requirements during the retroactive period. The results of the Florida review were provided by letter from FDEP to the FWS dated August 2, 2007.

Earlier this year, in the context of the ongoing litigation, Florida obtained a previously undisclosed letter dated November 6, 2007 from the COE to FWS which addressed the issues raised in Florida's August 2, 2007 letter. The technical substance of the COE letter is that Florida had misunderstood or misinterpreted the volumetric balancing. We neither misunderstood nor misinterpreted the volumetric balancing. Instead, at each step the release rules and operating procedures have been changed or modified to provide after-the-fact justification for under-releases.

In the November 6, 2007 letter, for example, we now find an assertion that "the IOP provides for a certain degree of smoothing of releases." No such statement appears in the IOP and this new rule is so vague and imprecise that it allows the federal agencies to make releases at levels below the IOP requirements under the guise of smoothing the releases. Further, the letter confirms that the rules used to claim retroactive storage credits to offset the May 2007 violations were determined using a different set of rules. Sadly, it appears that we should not have assumed that the COE and FWS would equitably apply the IOP requirements to the retroactive period used to justify the violations.

Rather than adding clarity and accountability, the COE/FWS consultations, letters and actions have made the release requirements for the Apalachicola River progressively more vague. We are left with no objective means of determining if the minimum release requirements above 5,000 cfs are being met. While the IOP appears to link basin inflow to releases from Jim Woodruff Dam, the combination of release "smoothing", claiming of storage credits and claimed discretion in performing volumetric balancing substantively allows the COE to limit releases to the Apalachicola River while maximizing retention of water in the federal reservoirs. This lack of accountability and objective measures is carried forward into the Modified IOP.

The original IOP placed a disproportionate share of the detrimental impacts of drought on Florida and the Apalachicola River. The Modified IOP clearly makes matters even worse for

Florida by effectively transferring additional drought impacts to Florida. Simultaneously, the COE/FWS have preemptively claimed and exercised discretion in determining storage credits to the point that credits were claimed for periods pre-dating the effective date of the original IOP, the volumetric storage account was changed and some unspecified level of release smoothing is now being anticipated by the COE. This makes it possible for the COE/FWS to release less than the minimums under the guise of smoothing or through use of storage credits. Thus, Florida has no assurance that the minimum daily releases will actually be received.

Sincerely,

Douglas E. Barr
Executive Director

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S A V I N G A N A M E R I C A N T R E A S U R E

May 20, 2008

Ms. Gail Carmody
US Fish & Wildlife Service
1601 Balboa Avenue
Panama City, FL 32405

RE: Modifications to Interim Operations Plan (IOP) at Jim Woodruff Dam-April 15, 2008

Dear Ms. Carmody:

This letter is to express our continued opposition to the reduction in flows proposed in the referenced IOP to the Fish and Wildlife Service by the Corps of Engineers. Please consider these comments in your determination. Our comments are focused on the following issues:

1. **Proposal lacks consideration of providing a flow regime with timing, duration and volume required to sustain the fish and wildlife of the Apalachicola River and Bay on which the economies of the local communities depend.**

    - Local observations document that the 1989 IOP, current IOP, and proposed IOP have caused severe impacts to endangered species and the entire Apalachicola ecosystem (see ATTACHMENT ITEMS 1, 3, & 8 for additional information);
    - Studies have been provided documenting that die offs of the endangered mussels such as those experienced last year are likely to result in extinction of the mussels on the Apalachicola (see ATTACHMENT ITEM 2 for additional information);
    - The Corps has ignored the authorization from Congress to protect fish and wildlife as an authorized use of the system, and have focused its Apalachicola concerns solely on endangered species (see ATTACHMENT ITEM 8 for additional information); and
    - U.S. Fish and Wildlife Service previous Biological Opinion focused primarily on the endangered species and should have considered flows that provide for the broader indicators for fish and wildlife and the habitats that sustain them (see ATTACHMENT ITEMS 1, 2, & 8 for additional information).

2. **Methodologies used in the IOP favor North Georgia water supply and are biased in its allocation of water resources for purposes not authorized by Congress.**

    - The Corps proposed IOP was developed without comprehensive assessment of impacts to downstream Florida water users and therefore contains a built-in bias to provide water to the North Georgia water users (see ATTACHMENT ITEMS 3, 4, 5, & 6 for additional information);

- The proposed IOP uses triggers that impose all the consequences of the drought on the Florida portion of the basin and impose no requirement on Georgia to conserve or reduce water use - unnecessarily sacrificing endangered and threatened species (see ATTACHMENT ITEMS 3, 4, 5, & 6 for additional information);
- Triggers should be incorporated into the proposal that impose incentives or requirements for conservation and reduction of use to upstream water users; and is necessary for the Corps to equitably, effectively, and realistically manage the ACF system in compliance with federal law to avoid take (see ATTACHMENT ITEMS 5 & 6 for additional information); and
- The State of Georgia leadership has repeatedly demonstrated its willingness to sacrifice endangered species, Florida economies and communities, and treasured natural resources without imposing reasonable and prudent measures to protect and conserve its water supply, all the while blaming the Corps and Florida for purported shortages to its water supply (see ATTACHMENT ITEM 7 for additional information).

3. The 1989, current and proposed IOP conflicts with National Water Policy and the legality of all of these IOPs is questionable at best.

- National Water Resources Planning Policy directs that the all water resources projects should protect the environment by protecting the functions of natural systems and mitigate any unavoidable damage to natural systems.
- Water supply is not an authorized purpose of the ACF project and the intent of this proposal is to provide for water supply (see ATTACHMENT ITEM 3 for additional information). The ruling by the Federal Appeals Court in Washington, D.C. this year stated that water supply was outside of the Corps authority without Congressional approval. This ruling also clarified that the allowable actions under the Water Supply Act are being overstepped by the Corps action;
- A NEPA process is required for the type of changes made in the 1989 and subsequent IOPs. The short time frames arbitrarily imposed by the current Biological Opinion and its predecessor are not supportable; and
- The action lacks the required "consistency" with the State of Florida's Coastal Management Plan; therefore the proposed IOP is inconsistent with the Florida Coastal Management Plan approved by NOAA in 1981.

The Apalachicola River and Bay represent one of, if not the, last great riverine and estuarine system functioning in a highly productive state. We stand with you at a common threshold to decide if we will follow our predecessors who erred trying to meet insatiable demands with the resultant loss of unique and valuable resources such as the Florida Everglades and Colorado River. Billions of dollars are being spent to "restore" these systems to a remnant of their former natural condition and productivity. Please stand to reverse a long standing trend to destroy our nation's very best natural resources for the benefit of short term financial gain of a few. We sincerely hope that the USFWS will not see fit to participate in the continuation of this destruction of our public resources and heritage.

Thank you for consideration of these comments. If you have questions, please do not hesitate to contact me.

Best regards,

Dan Tonsmeire
Riverkeeper

ATTACHMENT: ADDITIONAL INFORMATION REFERENCED IN LETTER

CC: Governor Charlie Crist
Michael Sole – Secretary of DEP
Colonel Byron Jorns- Commander, Mobile District, U.S. Army Corps of Engineers

WATERKEEPER® ALLIANCE MEMBER

ATTACHMENT
ADDITIONAL INFORMATION FOR USFWS MAY 20, 2008 LETTER

1. The Endangered Species Act (ESA) is primarily focused on the preservation of the identified species, including their habitats needed to perpetuate the species. The links between floodplain species, fish, spawning, and nutrients for growth and reproduction are complex and often extremely difficult to completely understand. However, observations by local individuals, state, regional and federal agencies over the past year verify and document degradation and change to the Apalachicola River floodplain, delta, and estuary and indicate the entire ecosystem is under severe stress which could result in irreversible long-term impacts. The data from last year leave very little room to dispute that the Apalachicola ecosystem cannot withstand a continuation of the conditions the Corps has arbitrarily defined and proposed without a full and comprehensive study of what the impacts will be and alternatives might include.

2. For the specific threatened and endangered species, the loss of tens of thousands of Fat Three Ridge mussels has been documented. A report that was submitted to your office (Simulation Models of Harvested and Zebra Mussel Colonized Three Ridge Mussel Populations In the Upper Mississippi River co-authored by one of the Corps scientist that has studied the Apalachicola mussel populations), portrays a similar die off which resulted in the extinction of a local population of this same species of mussels. This information should be sufficient to take action that will prevent further jeopardy of the species and at the same time provide a better opportunity for the entire Apalachicola ecosystem and affected Florida local economies to survive.

3. This current IOP proposal in effect allocates a limited amount of water to supply the North Georgia metropolitan area without adequately considering the negative impacts to water users downstream from the Atlanta Regional area, including the Apalachicola River and Estuary. The proposal could provide extended duration of low flows beyond what was allowed last year without imposing consequences to the North Georgia water users. A comprehensive impact assessment should be undertaken that includes the impacts/harm that resulted to the resources of the River and Bay last year.

4. “Basin inflow” as currently used by the Corps is a calculated parameter which ignores depletions (withdrawals and evaporation) from the system. These depletions lower the actual basin inflow to the system and move it closer to thresholds which trigger reduction in flows downstream to the Apalachicola. Once thresholds are reached, more water is held back for upstream use. Therefore, the more water depleted from the system, the quicker downstream flows will be reduced with commensurate increases in impacts. Because the depletions are left out of the calculation it is impossible to measure the impact of depletions or levy any measurable impact on upstream water supply uses.

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5. Similarly, using composite storage levels as a trigger to reduce flows downstream provides no incentive to upstream users to conserve water in the system. The more expediently basin inflow and composite storage are reduced by withdrawals the quicker water is held back for upstream users at the expense of the Apalachicola River and Bay. The net result of these two triggers is an incentive to withdraw more water from the system and expedite reduction in releases downstream. The proposed trigger of a calculated basin inflow should be changed and replaced with a trigger that is based on rainfall. This may require that a relationship between rainfall and historic inflow be developed. The triggers in the proposal should also incorporate a means to require the State of Georgia to reduce withdrawals and share in the impacts of a drought.

6. The current IOP proposal you have received for sustained reductions in flow lacks recognition of historic, documented uses in Florida while favoring upstream water users. Past and future water supply contracts that the Corps would endeavor to legally authorize should include language that enables the Corps to reduce storage and withdrawals specified in those water contracts when basin inflow (based on accurate metrics) reaches a certain threshold. This would allow for a commensurate reduction to be implemented across all users upstream and downstream. Without this type of control measure, the end result will be an inequitable loss of the economic livelihoods of one area for the gain of another.

7. Georgia has demonstrated it is willing to take any advantage to increase its water supply. In February of this year the leadership of Georgia opted to relax water use restrictions. On March 1, Georgia passed up an opportunity to declare a drought which would have enabled the State to reduce agricultural irrigation use and provide those waters in the Flint River to augment flows to the Apalachicola. While claiming that the criteria were not met to enact these measures on the Flint, the criteria for meeting water quality at Peachtree Creek below Atlanta was requested to be overridden to save water in Lake Lanier. These actions are clearly arbitrary and capricious in forming decisions that respect or ignore criteria to achieve an economic advantage to Georgia water users. Such arbitrary decisions should not be overlooked in the course of your decision to allow further loss of endangered species.

8. The observations of 2007 impacts to the Apalachicola Estuary are undeniable. The authorized purpose associated with Jim Woodruff Dam for fish and wildlife should be given more consideration than the unauthorized purpose used by the Corps to provide water supply for North Georgia. Reduced and sustained low flows will surely cause crop failure for oysters, shrimp, crawfish and result in a tremendous domino effect throughout the food chain from the River to the Bay to the Gulf of Mexico, costing livelihoods of thousands of Floridians. These impacts will not be short lived; the recovery of the Apalachicola ecosystem will be prolonged and uncertain. Who better to point this inconsistency out to the Corps than the USFWS?

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Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive, Suite 1152 East Tower, Atlanta, Georgia 30334
Noel Holcomb, Commissioner
Carol A. Couch, Ph.D., Director
Environmental Protection Division
(404) 656-4713

May 23, 2008

By Email, Fax and Overnight Delivery
Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL 42305-3721

Mr. Curtis M. Flakes
Chief, Planning and Environmental Division
Mobile District
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001

RE: Endangered Species Act Section 7 Consultation on the Corps' Proposed Modifications to the Interim Operations Plan

Dear Ms. Carmody and Mr. Flakes:

Please accept the following comments on behalf of the State of Georgia as a supplement to the comments contained in my prior letter dated May 15, 2008. The purpose of this supplement is to respond to comments made by Michael Sole of the Florida Department of Environmental Protection ("FDEP") in a letter to Ms. Carmody dated May 15, 2008 and to respond to several inaccurate and confusing assertions made by Douglas E. Barr of the Northwest Florida Water Management District in a letter attached to Mr. Sole's comments. While many of the issues raised by Mr. Barr have already been addressed in Georgia's prior comments, some of Mr. Barr's statements contain misleading information that should be corrected or properly explained.

In the comments made by Mr. Sole, he makes reference to "the impact of upstream depletions on [the Corps'] ability to meet downstream flow requirements." The U.S. Army Corps of Engineers (the "Corps") has no jurisdiction or responsibility to mitigate for depletions throughout the basin. Moreover, municipal and industrial depletions are a small percentage of the flow at the state line. For example, metro Atlanta's net consumption in 2007 was only 1.3% of the Apalachicola River's long-term annual average flow and only 5.7% of the 5,000 cubic feet per second ("cfs") minimum required flow at the Chattahoochee gage.

Mr. Sole also references the possible addition of water storage projects within the boundaries of Georgia through the construction of new non-federal reservoirs. The prospect of any such additional storage is still several years in the future and is not relevant to the current consultation. As stressed in my prior comments, the Corps' Modified Interim Operations Plan, as outlined in the Corps' letter to the Fish and Wildlife Service on April 15, 2008 (the "Modified IOP"), is temporary in nature and will only last until permanent water control plans and manuals for the federal reservoirs in the Apalachicola-Chattahoochee-Flint ("ACF") Basin have been completed. Therefore, water usage and storage projects within the State of Georgia which will not occur for several years should not be considered in the consultation process for the Modified IOP.

Mr. Barr raised several objections to the original IOP as implemented by the Corps. In particular, Mr. Barr makes the assertion that "[w]ater held in storage in Lake Lanier, West Point Lane and Lake Water F. George is never used to support flows to the Apalachicola River." *See* Barr Letter at p. 2. This statement is unsupported by the facts and completely false. As pointed out in my prior comments, in a span of seven months during 2007, the Corps used approximately 850,000 acre-feet of available storage within the ACF system just to support a minimum flow of 5,000 cfs to the Apalachicola River. This equates to approximately 52% of the available conservation storage for the entire system. By late November of 2007, only 33% of the conservation storage within the ACF system remained as a result of that augmentation. This augmentation provides flows that would not have otherwise been available to support the threatened and endangered species in the Apalachicola River during periods of extreme drought. Georgia continues to maintain that the amount of augmentation currently provided by the Corps exceeds what is actually necessary to support those species.

Mr. Barr also raises several objections to the Modified IOP. Mr. Barr attempts to argue that releases allowed when system storage falls into the Modified IOP's "Exceptional Drought Trigger Zone" would have resulted in a net reduction of flows when compared to flows observed during the drought of 2000. To the contrary, if the Modified IOP had been in place in 2000, flows at the Chattahoochee gage would not have reached the minimum flows actually experienced. Under 2000 hydrologic conditions, had the Modified IOP been implemented, system storage would not have reached the "Exceptional Drought Trigger Zone." As a result, the minimum flow at the Chattahoochee gage would have remained at 5,000 cfs. Instead, flows at the Chattahoochee gage reached as low as 4,530 cfs in that year, and were below 5,000 cfs for 34 days.

Mr. Barr points out that the ACF system could remain in the Exceptional Drought Trigger Zone even though up to 60% of conservation storage remained in the system. What Mr. Barr fails to take into account is the seasonal nature of the Corps' ability to store water in the ACF system. It is vital to the overall health of the system that the reservoirs be as full as possible at the beginning of the dry period. As mentioned above, the Corps used 52% of system storage in 2007 to augment for low basin inflows. If the total system storage were to be at only

60% at the beginning of another dry summer, it would be very difficult for the Corps to maintain any augmentation throughout the course of a multi-year drought.

Finally, Mr. Barr contends that, as a result of the Corps' volumetric balancing procedures, Florida receives less flow than it claims to be entitled under the provisions of the IOP. The Corps has already adequately addressed FDEP's concerns as they relate to those procedures. As pointed out in my prior comments, the Corps is actually over-releasing water from storage as a result of head-limit differences, ramp-down restrictions, and operational imprecision, and the Corps' current volumetric balancing procedures do not provide sufficient opportunities to regain storage wasted by those over-releases.

Thank you for your careful consideration of these supplemental comments. If I may provide any additional information that would be helpful to you in your consideration of the Modified IOP, please let me know.

Sincerely yours,

Carol Couch, Director
Georgia Environmental Protection Division

cc: Brig. Gen. Joseph Schroedel, South Atlantic Division Commander, U.S. Army Corps of Engineers
Colonel Byron Jorns, District Commander, U.S. Army Corps of Engineers, Mobile District
Mr. Chuck Sumner, Inland Environment Team, U.S. Army Corps of Engineers, Mobile District

The Florida Coastal and Ocean Coalition

Caribbean Conservation Corporation & Sea Turtle Survival League •
Reef Relief • Gulf Restoration Network • Natural Resources Defense Council •
The Surfrider Foundation • Ocean Conservancy • Environmental Defense Fund

May 30, 2008

Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Avenue
Panama City, FL 32405-3721

RE: Public Comment on Potential Impacts to Endangered Species Related to Reduction in Water Flows in the Apalachicola-Chattahoochee-Flint River (ACF).

Dear Ms. Carmody,

We are writing to express our concern for federally listed species in relation to the Army Corps of Engineers, Mobile District, and (Corps) proposed *Modification to the Interim Operations Plan at Jim Woodruff Dam* (Plan), to which they've requested from your office a Section 7 consultation pursuant to the Endangered Species Act (ESA). The Florida Coastal and Ocean Coalition, representing seven conservation organizations with over a million members and supporters across the country and more than 200,000 in Florida, believes the Corps' proposed action would not only adversely modify vast areas of critical habitat for federally listed species but jeopardize the existence of the Gulf Sturgeon and protected mussel populations in the Apalachicola-Chattahoochee-Flint River (ACF) watershed.

As you know, the coastal estuary of Apalachicola Bay needs dynamic flows of fresh water to support its floodplain and the complex ecosystem that supports habitat for numerous federally protected species. The Corps Plan, similar to the current operating plan, creates extraordinary long durations of low flows resulting in higher salinities within critical habitat areas. As noted by the Florida Fish and Wildlife Conservation Commission (FWCC) in previous comments to your office, salinities under the current plan are 3 to 4 times higher than average salinities.

We believe the salinity issue raised by FWCC strongly supports a jeopardy determination under the applicable criteria of the ESA. It is a serious concern to us that FWCC documents "most, if not all" of the freshwater submerged aquatic vegetation in Apalachicola Bay, an area known to be preferred habitat for juvenile and sub-adult Gulf sturgeon, disappeared during the summer of 2007 when long duration, low flows took place. This adverse modification of habitat likely had cascading effects throughout the food web, further stressing the species. It is reasonable to infer that this stress significantly interfered with the species' rate of growth, reproduction and development.

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This adds to the cumulative impacts of additional stressors related to a longer developmental period in which predation is likely, coupled with an altered habitat environment inviting “higher salinity” species to prey upon them.

It is this cumulative and cascading effect of adverse impacts on both critical habitat and critical life stages, due to human activities, which is most troubling. The proposed Plan’s stagnant rates of reduced flows will interfere with essential flooding of coastal marshes that, according to normally fluctuating tidal surges, creates a dynamic mix of fresh and saltwater allowing a multitude of flora and fauna to thrive. Stagnant low flows also significantly decrease the influx of nutrients into the coastal flood plain and further downstream into the tidal system and the offshore environment.

We are also deeply concerned about the impacts that low flows are creating along the Gulf shelf where numerous stakeholders and federal agencies have invested time and resources for protection of species and fisheries. As I’m sure you are aware, Apalachicola Bay has been recognized as an exceptionally valuable estuarine system, one of the most outstanding left in the United States. The Gulf of Mexico is also an exceptional natural resource for America and the Gulf is reliant upon the health of the ACF system in order to maintain its vitality.

On behalf of the hikers, birders, hunters, fishermen, divers, scientists, researchers, and citizens to whom the Coalition represents, we call upon the U.S. Fish and Wildlife Service to protect and defend the unique species inhabiting the ACF. America has a long tradition of placing the value of species protection in high regard; the ESA is an embodiment of those values. We encourage your office to be bold in fulfilling its critical role in this process, being the trigger to a framework compelling societal balance and sustainability with nature.

Sincerely,
Gary Appelson – Caribbean Conservation Corp.
Sarah Chasis, J.D. – Natural Resources Defense Council
Ericka D’Avanzo – Surfrider Foundation
Jerry Karnas – Environmental Defense Fund
Paul G. Johnson – Reef Relief
Joe Murphy – Gulf Restoration Network
David White, J.D. – Ocean Conservancy

cc: Honorable Members of Florida’s Congressional Delegation
Charlie Crist, Florida Governor
Dirk Kempthorne, U.S. Department of Interior
Jim Connaughton, U.S. Council on Environmental Quality
Dale Hall, Director, U.S. Fish and Wildlife Service
Sam Hamilton, Regional Director, U.S. Fish and Wildlife Service
Mike Sole, Florida Department of Environmental Protection
Ken Haddad, Florida Fish and Wildlife Conservation Commission
Distribution

Mr. Curtis M. Flakes
Chief, Planning and Environmental Division
Mobile District
U.S. Army Corps of Engineers
P.O. Box 2288
Mobile, AL 36628-0001

Ms. Gail Carmody
Supervisor, Ecological Services
U.S. Fish and Wildlife Service
1601 Balboa Ave.
Panama City, FL 32405-3721

May 29, 2008

Re: Proposed Modifications to Interim Operations Plan for ACF Reservoirs

Dear Mr. Flakes and Ms. Carmody:

I offer the following comments on the Corps' proposed modifications to the Interim Operations Plan ("MIOP") for its reservoirs in the Apalachicola-Chattahoochee-Flint ("ACF") River Basin on behalf of the Atlanta Regional Commission, the City of Atlanta, Georgia, Fulton County, DeKalb County, Cobb County-Marietta Water Authority, and the City of Gainesville, Georgia (collectively, the "Water Supply Providers"). Technical materials prepared by Megan Rivera, Ph.D. of Hydrologics, Inc. and George McMahon, Ph.D. of Arcadis are also attached.

First, let us begin by expressing our sincere appreciation to you and your respective agencies for your efforts to manage water resources in the ACF Basin. Although we strongly disagree with many of the decisions that have been made, and with the process used to make them, we do understand that you are using your best efforts in an extremely difficult situation.

The following comments are organized in two sections. The first section is directed at specific provisions of the MIOP. The second addresses a number of more fundamental considerations that need to be considered in the development of the new Water Control Plan for the ACF Basin.

To summarize our evaluation of the MIOP, we believe that, while it represents a slight improvement over the original IOP, it suffers from many of the same fundamental flaws. We have already shown that better alternatives exist. We urge you to give serious consideration to these alternatives rather than continuing to make incremental changes to a plan that should never have been adopted in the first place.

Indeed, we are extremely concerned that the MIOP will form the basis for the Water Control Plans that are currently in the process of being developed. We can and must do better. In other words, although we understand that we will likely have to live with the IOP/MIOP framework for some time to come, we believe this framework should be set aside at the first opportunity.

1. Comments on Specific Provisions of the MIOP

1.1 Refill Opportunities Are Still Too Limited

As the events of the past year demonstrate, the IOP's minimum flow requirements and restrictions on the Corps' ability to store water are unsustainable during a prolonged drought. The MIOP alters these provisions in several ways, and in this respect, constitutes an improvement over the IOP. Indeed, the modifications allowing storage of all flows above 5,000 cfs from December to February and reducing the prohibition on storage to 50% of Basin Inflow are welcome changes.

However, these modifications do not go far enough. Refill opportunities are still severely restricted during the wet period from March to May and the 50% prohibition on storage is too restrictive. The MIOP ensures that reservoir levels are consistently lower than is beneficial to many users in the system. These provisions can and should be modified to allow greater opportunities to refill the reservoirs. This would substantially benefit the reservoir system, and all those who rely upon it, with little to no effect on downstream flows.

Florida would have the Corps believe otherwise. In its letter dated May 15, 2008, Florida complains that release requirements for certain periods have been reduced under the MIOP to 50% of Basin Inflow, as opposed to 70% of Basin Inflow under the original IOP. As a result of this change, Florida claims that "flows to the Apalachicola River will be reduced by up to 20% of basin inflow under the Modified IOP in comparison to the original IOP." This is simply not correct.

The reality is that only a small fraction of Basin Inflow can actually be captured in storage, regardless of what the MIOP might allow. The fraction of Basin Inflow that can be stored depends on the distribution of inflow in relation to storage. Of the 17,230 $mi.^2$ drainage basin above Lake Seminole, 95% is below Lake Lanier, which represents 65% of total system storage; 80% is below West Point, which, together with Lake Lanier, represents 85% of total system storage; and 57% is below Walter F. George, which is the last storage project in the system. *See Figure 1*. In other words, run-off from 57% of the basin cannot be captured in any reservoir and 80% of the basin is controlled by the smallest storage project in the system, with only 244,000 acre-feet.

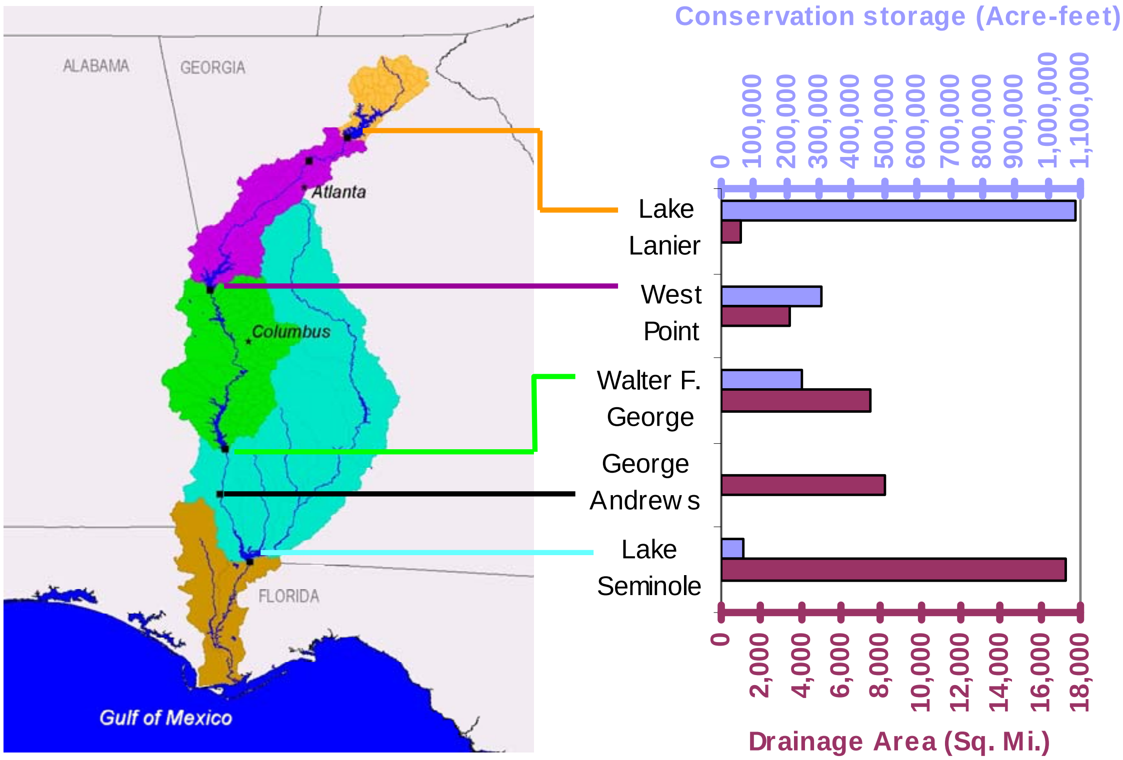

Figure 1. Conservation Storage and Drainage Basin for ACF Reservoirs.

The end result is that only a small fraction of Basin Inflow can actually be captured and stored in the federal reservoirs, because of their location in the basin, no matter what the rules theoretically allow. For example, for the period from January 2007 to present, the MIOP provision allowing storage of up to 50% of Basin Inflow would result in the actual storage of only 8% of Basin Inflow—the remaining 92% would pass downstream to Florida. Similarly, for the period from 2003 to 2004, the Corps would actually be able to store only 1% of Basin Inflow under the MIOP, whereas 99% would be passed downstream to Florida.

Because the Corps' ability to store water is so limited, the provision of the MIOP theoretically allowing storage of up to 50% of Basin Inflow cannot significantly impact flows in the Apalachicola River. Figure 2 through Figure 4 illustrate this point by comparing flows at the Chattahoochee gage under the IOP with those under the MIOP for three 2-year periods.[1] As these figures show, changes in storage limitations under the MIOP have virtually no effect on flows at the Florida line.

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[1] All simulations discussed in this letter were prepared by Hydrologics, Inc. using the OASIS platform. Information concerning the validation of this model against HEC-5 is provided in Exhibit A. The models produce essentially the same results when the same assumptions are used. OASIS was used in preference to HEC-5. We would be happy to answer any questions that the Corps or Fish and Wildlife Service might have about these model runs.

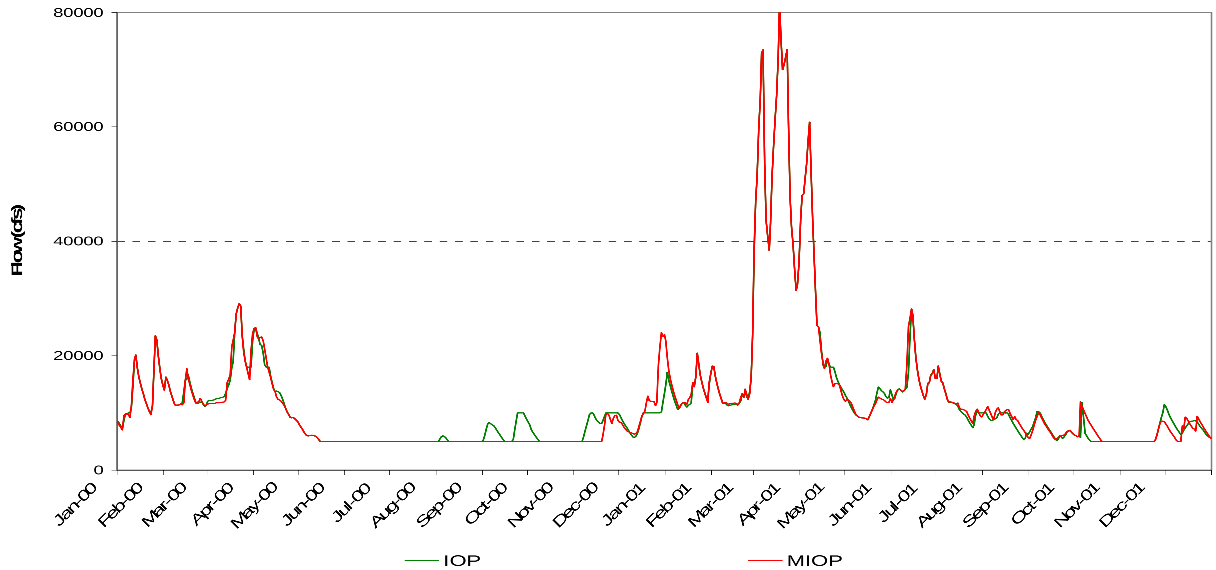

Figure 2. Comparison of flows at the Chattahoochee gage under IOP and MIOP for period from January 2000 through December 2001.

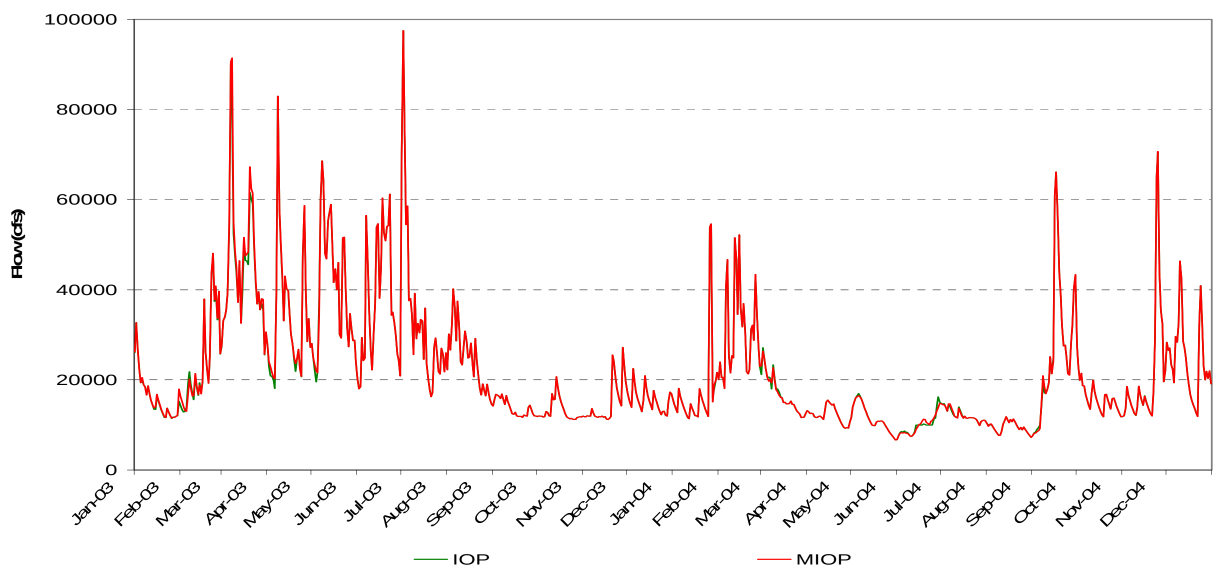

Figure 3. Comparison of flows at the Chattahoochee gage under IOP and MIOP for period from January 2003 through December 2004.

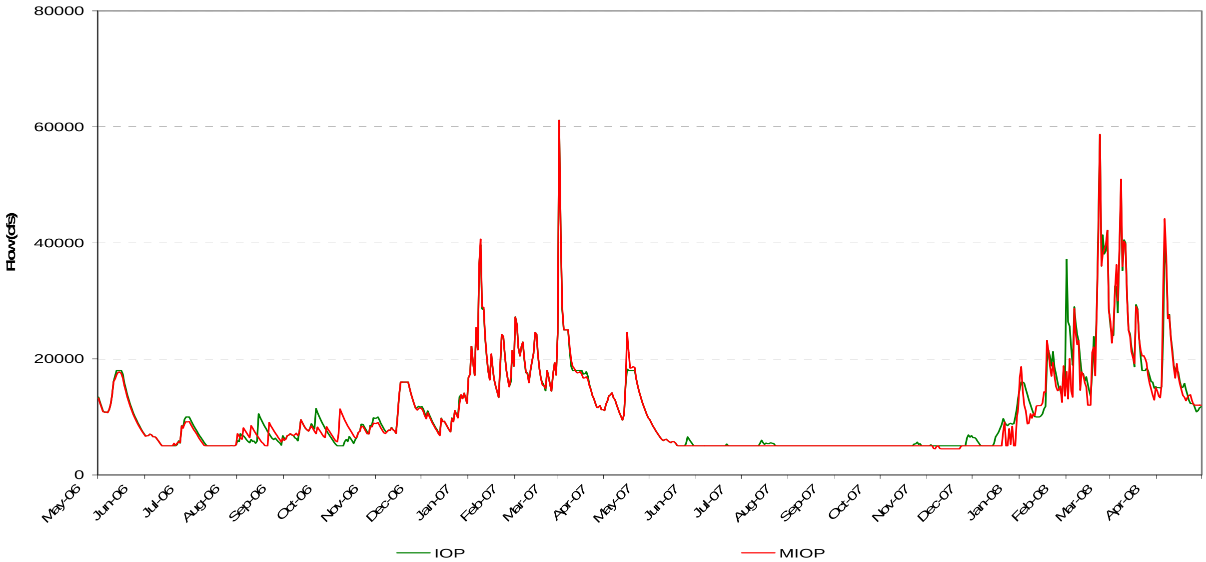

Figure 4. Comparison of flows at the Chattahoochee gage under IOP and MIOP for period from May 2007 through April 2008.

From this, two things are clear. First, Florida's argument that the MIOP will result in significantly reduced flows in the Apalachicola River is plainly not correct. Second, the Corps can and should utilize every opportunity to store water when such opportunities arise—and, given the placement of storage within the basin, such storage will have little appreciable effect on flows at the Florida line.

1.2 Down-Ramping Rates Are Unnecessary and Unreasonable

The ramping restrictions in the MIOP revert back to the rules set forth in the original IOP, which had previously been modified with the approval of the United States Fish and Wildlife Service. We believe the modified ramping restrictions approved by USFWS on October 19, 2008 were more appropriate.

The ramp-down restrictions in the MIOP require the Corps to release large amounts of water from storage to "smooth out" the natural variations in stream flow that occur when it rains. Instead of storing water associated with rainfall events, as it could and should, the Corps is instead required to release substantial amounts of water from storage to provide a gradual ramp-down from the high flows that result from these rainfall events. The result, at times, has been that rainfall events may actually *reduce* storage rather than increasing it.

This is not appropriate. Ramp-down requirements should not be imposed to reduce the rate of fall of the river after a natural rainfall event. Rather, ramping requirements should only be used to transition between significant man-made alterations of the flow regime, such as between spawning and non-spawning flows or between navigation releases and normal operations.

The modified ramp-down restrictions in effect since October 2007 took these considerations into account. As we understood that rule, ramp-down restrictions were tied to the "Basin Inflow fall rate" rather than to the IOP maximum fall rate schedule. The one problem with the rule approved by the Service in October 2007 is that it might be necessary at times to ramp-down even when Basin Inflow is rising or remaining steady. Therefore, we suggest that the fall rate should be the *maximum* of (1) the Basin Inflow fall rate; or (2) the maximum fall rate schedule.

1.3 The "Volumetric Balancing" Scheme Is So Restricted as To Be Useless

Although the Corps originally stated, when it adopted the IOP, that it would employ "volumetric balancing" to recapture storage that is used to meet ramp-down requirements. The limitations stated in the letter to the Fish and Wildlife Service dated May 16, 2007 essentially negate this commitment.

The letter includes several conditions that must be met for storage credits to accumulate: (a) the actual release must be greater than the minimum required by the IOP; (b) the release required to comply with the fastest ramping rate allowed is greater than the minimum IOP required release; (c) today's release is less than yesterday's release (i.e., downramping is occurring); and (d) today's total storage is less than yesterday's total storage. When all of these conditions are met, the credit is equal to the *lesser* of (a) the decline in storage; or (b) the difference between the actual release and the minimum IOP required release.

We can think of no logical basis for limiting the accumulation of storage credits to situations where system storage is actually declining. A restriction preventing the accumulation of storage is no different from a requirement to release storage.

Two other aspects of the volumetric balancing scheme are particularly problematic. First, the letter states that volumetric balancing must be accomplished within 10 days and may not involve more than 10,000 day-second-feet (dsf) of storage. There is no basis for these temporal and volumetric limits. If the Corps is required to expend large quantities of storage to slow artificially the river's natural rate-of-fall, it should be permitted to recoup that storage as flows permit. Second, "credits" can only be used during high-flow periods (above 10,000 cfs). At such times, storage credits simply serve to refill the lower reservoirs a few days earlier. As a result, the storage that is "saved" by applying volumetric credits is "spilled" a few days later when the reservoirs are full.

These limitations render the volumetric balancing scheme essentially worthless. For example, by our calculations, ramping requirements caused approximately 90,000 acre-feet of water to be released in excess of IOP release requirements from May to October 2007. Of this amount, only 3,000 acre-feet could have been recovered through volumetric balancing in accordance with the restrictions imposed by the May 16, 2007 letter. *See* Exhibit B.

1.4 The MIOP's Drought Provisions Are Flawed

The MIOP constitutes a definite improvement over the IOP to the extent that elements of the Exceptional Drought Operations (EDO) Plan have been included. The absence of any such drought provisions was obviously a major omission in the original IOP. Nevertheless, two of these provisions need to be changed.

1.4.1 The Use of "Composite Storage" as the Trigger for Drought Operations Ignores Special Consideration that Should be Given to Lake Lanier.

First, we continue to object to the use of a drought trigger based on Composite Storage. Composite Storage does not accurately reflect the status of system storage. Because the lower reservoirs refill so quickly, in comparison to Lake Lanier, it is possible for system storage to be in Composite Zone 2—the threshold under the MIOP for ending Drought Contingency Operations—even while Lake Lanier is still in Zone 4.

To assess this probability we modeled the probability that system storage would reach Composite Zone 2 by April 30, 2009 under the MIOP, based on starting conditions as they existed on May 1, 2008. Probabilities were calculated using the Hirsch method to prepare conditional streamflow forecasts. The results are provided in Table 1 below. The analysis shows a 62% probability that system storage will reach Composite Zone 2—and hence that drought operations will end—at a time when Lake Lanier is still in Zone 4. This shows that the Drought Contingency Operations will terminate too soon in most cases. *See* Exhibit C.

Table 1. Probability that System Storage Will Reach Composite Zone 2 by April 1, 2009, Terminating Drought Operations, While Lake Lanier is in a Given Zone

	System Storage Reaches Composite Zone 2 When …				**System Storage Does Not Reach Composite Zone 2**
	Lanier is in Zone 4	Lanier is in Zone 3	Lanier is in Zone 2	Lanier is in Zone 1	
# years in simulation	42 of 67	10 of 67	0 of 67	0 of 67	15 of 67
probability	62%	15%	0%	0%	22%

Instead of using Composite Storage, drought operations should continue until *Lake Lanier* is in Zone 1. Alternatively, it is possible to construct a rule based on forecasts of the probability that Lanier will refill within a certain period of time. Such a rule would have the potential to optimize operations using the best available information.

1.4.2 The "Drought Zone" Is Too Low

We do not believe the "Drought Zone," as currently drawn, sufficiently protects users who rely on reservoir storage. By the time system storage has fallen into the Drought Zone, the system is already at a severe risk and past the point at which emergency actions should be taken. What is more, initiating drought operations when conservation storage is nearly exhausted would be particularly problematic in a prolonged, multi-year drought. In that case, conservation storage could be almost completely expended early in the drought period and prior to the commencement of drought operations. This would leave insufficient storage to meet needs in the basin, including water supply for metropolitan Atlanta, in the remaining drought years.

We reiterate that it is inappropriate for the drought trigger to be based on Composite Storage. But if the Corps is determined to use Composite Storage as the trigger for reducing minimum flow requirements, the flow should be reduced immediately whenever the system is in Composite Zone 4, and such measures should remain in place until Composite Storage and Lake Lanier have both recovered to Zone 1.

1.4.3 The "Drought Zone" Is Arbitrary

Furthermore, the delineation of the "Drought Zone" appears to be completely arbitrary. The Corps' letter to FWS states that the Drought Zone delineates a volume of water "roughly equivalent" to the amount of storage in the inactive storages in Walter F. George and West Point and Lake Lanier combined with the amount of storage in Lake Lanier Zone 4. In other words, the Drought Zone will generally be entered when the lower reservoirs are empty (of conservation storage) and Lake Lanier is in Zone 4. But the description further states—without explanation or justification—that the Drought Zone has been "adjusted" to include a "smaller volume of water at the beginning and end of the calendar year." What is the basis for these "adjustments" to the Drought Zone, and why would it ever be appropriate to terminate emergency operations at a time when the lower reservoirs are empty and Lake Lanier is in Zone 4?

1.5 Forecasts Should be Used To Improve Reservoir Operations

A large body of literature has been developed on the subject of hydrological forecasting. The United States Geological Service (USGS) has been using and relying on these methods for decades. The Corps should utilize these tools, with appropriate margins of error, to optimize reservoir operations.

The MIOP uses "Composite Storage" as the principal indicator of drought conditions, but this is a poor surrogate for a good forecast. Operations in the Spring of 2007 under the IOP/Concept 5 provide a case in point. Concept 5 required the Corps to meet a "desired flow" of 6,500 cfs—as opposed to the "required flow" of 5,000 cfs—until composite storage fell to Zone 3. The Corps began releasing water from storage to meet the "desired" target of 6,500 cfs on May 8, 2007, at a time when the available forecasts were already predicting an extremely dry summer. The predictable result was a rapid, pointless depletion of system storage—42,000 acre-feet of water were released between May 8 and May 31, at which time system storage fell into Composite Zone 3 and releases were finally reduced.

The 42,000 acre-feet of water that were released from May 8 to May 31 to meet the "desired flow" of 6,500 cfs equates to over a foot of elevation in Lake Lanier—enough water to meet the average annual consumptive needs of the metropolitan area (250 cfs) for 84 days. The loss of this water had a lasting impact on system storage, which still has not recovered. In exchange for this substantial cost, the temporary increase in flows to the Apalachicola River had no lasting benefit. After depleting system storage to the level of Composite Zone 3 within just 3 weeks, flows in the Apalachicola River fell to the "required" level of 5,000 cfs and remained at that level throughout the summer and fall—that is, until the alarming loss of system storage caused the "required" flow of 5,000 cfs to be reduced even further. Therefore, any organisms requiring flows at or above 5,000 cfs must have perished during the long period after May 31 when flows were at or below this level.

Needless to say, we are pleased to see that the Corps has taken these events to heart and has modified the IOP to eliminate the "desired flow" of 6,500 cfs. The larger point remains, however, that release requirements and flow reductions under the MIOP are still tied to Composite Storage without reference to hydrological forecasts. This is a fundamental flaw in the framework of the IOP.

1.6 Lanier Should Not Be Used To Balance the Lower Reservoirs In Cases Where the Lower Reservoirs Can Fill On Their Own, Without Support From Lake Lanier

Also, although it is generally appropriate to use Lanier to balance the lower reservoirs, this does not always make sense. Releasing water from Lanier to help refill West Point and Walter F. George as the top of their conservation pools rise between February and June is especially wasteful. In most years the only effect of releasing water from Lake Lanier to balance the lower reservoirs is to fill the lower reservoirs a few days earlier. This is wasteful in situations where system storage is low and needs to be preserved, and where it is unlikely that Lake Lanier itself will refill. In these cases intervening flow should be used to refill the lower reservoirs instead of releasing water from storage in Lake Lanier.

1.7 Release Requirements Should Consider Management Objective and Not Blindly Adhere to Basin Inflow

Another fundamental flaw in the MIOP is the fact that release requirements are blindly tied to Basin Inflow without operating for specific needs and balancing needs in the basin.

"Basin Inflow" is a legal construct with little connection to specific needs or operational objectives. Its original justification, as is clear from the record, was that reservoir operations could not be considered the legal cause of any environmental impacts caused by flows at least equal to Basin Inflow. Although this is legally correct, it does not follow that passing Basin Inflow is the best mode of operation for the reservoirs or that the Corps is legally required to operate in this manner.

The stated objective to maximize spawning habitat for the Gulf sturgeon is a perfect example. There is no evidence to show that reservoir operations have any effect on sturgeon spawning success, or that the amount of spawning habitat currently available at RM 105.5 is not sufficient to meet the needs of the species. Nonetheless, even if increasing sturgeon spawning habitat were an appropriate objective, the data show that the amount of spawning habitat available at RM 105 plateaus at 10,000 cfs to 11,000 cfs. Flows in excess of this amount actually *reduce* the amount of available habitat. Therefore, the MIOP is actually counter-productive to the extent it requires releases in excess of 11,000 cfs based on the level of Basin Inflow.

This is just one example of many. The more general point is that the Corps should strive to develop an operating plan in which release requirements are based on balanced operational objectives as opposed to abstract concepts like Basin Inflow.

1.8 Corps Models and Data Need to be Corrected

Finally, we are concerned that the Corps continues to use flawed models to evaluate modifications such as the MIOP. Deficiencies are detailed in the attached memorandum from George McMahon, Ph.D. *See* Exhibit D.

2. The Corps Should Not Attempt To Use Reservoir Storage to Drought Proof the Apalachicola River

In addition to commenting on the specific provisions of the MIOP, we have also taken this opportunity to address certain fundamental limitations of the ACF Reservoir system that need to be considered by all stakeholders in the development of water control plans for the ACF Reservoirs.

The reality is that reservoir operations cannot significantly affect the timing or quantity of flows in the Apalachicola River for any extended period of time. This is a consequence of the distribution of storage within the basin, as is described further in Section 2.1 below. Another consequence of the distribution of storage within the basin is that attempts to utilize reservoir storage to manipulate the Apalachicola River can quickly drain Lake Lanier, which may take years to refill. This is discussed further in Section 2.2. In terms of cost-benefit analysis, such operations provide negligible benefit to the Apalachicola River while creating significant economic hardship and creating great risks to the health, safety and well-being of the millions of people who rely on reservoir storage for water supply and other purposes. These impacts are discussed in Section 2.3.

Further, as is discussed in Section 2.4, the State of Florida's focus on metro Atlanta is completely misplaced. The truth is that metro-area water use is not a significant contributor to environmental issues in the Apalachicola River and Bay. Instead of pointing fingers, the State of Florida should work with the Corps to identify and address the causes of and potential solutions to these problems.

2.1 Reservoir Operations Cannot Significantly Affect Flows in the Apalachicola River Over an Extended Period of Time

One result of the upside-down distribution of reservoir storage within the ACF Basin is that reservoir operations cannot significantly affect the pattern of flows in the Apalachicola River. This can be seen by modeling a plan in which each reservoir is permitted to maximize storage subject only to at-site release requirements. For illustration purposes only we have modeled such a rule, which we call the "At Site Objectives" Plan. In this plan each reservoir operates to meet at-site objectives, including the 750 cfs flow target for Buford Dam and the 5,000 cfs flow target for Jim Woodruff.

Figure 5 and Figure 6 show the cumulative distribution of flows at the Chattahoochee gage for the MIOP and the "At Site Objectives" Plan. Although the MIOP does provide slightly higher flows in the range between 5,000 cfs and 15,000 cfs, *see* Figure 5, the difference is remarkably small and insignificant over the entire range of flows. *See* Figure 6.

The differences between the MIOP and the At Site Objectives Plan are even less significant when one considers impacts to the hydrograph. Figure 7 through Figure 9 show three representative two-year periods, two dry and one wet. These figures demonstrate that reservoir operations have little effect on the overall timing and pattern of flows in the Apalachicola River.

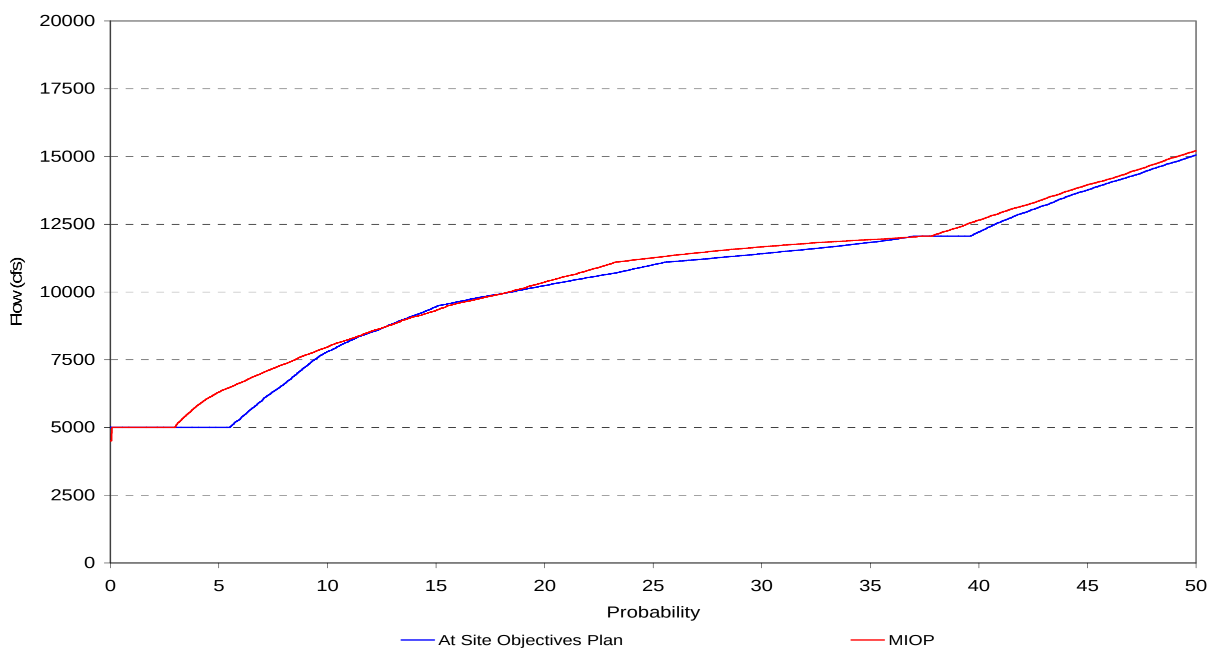

Figure 5. Flow at the Chattahoochee gage under MIOP as compared to flow under the "At Site Objectives" Operating plan.

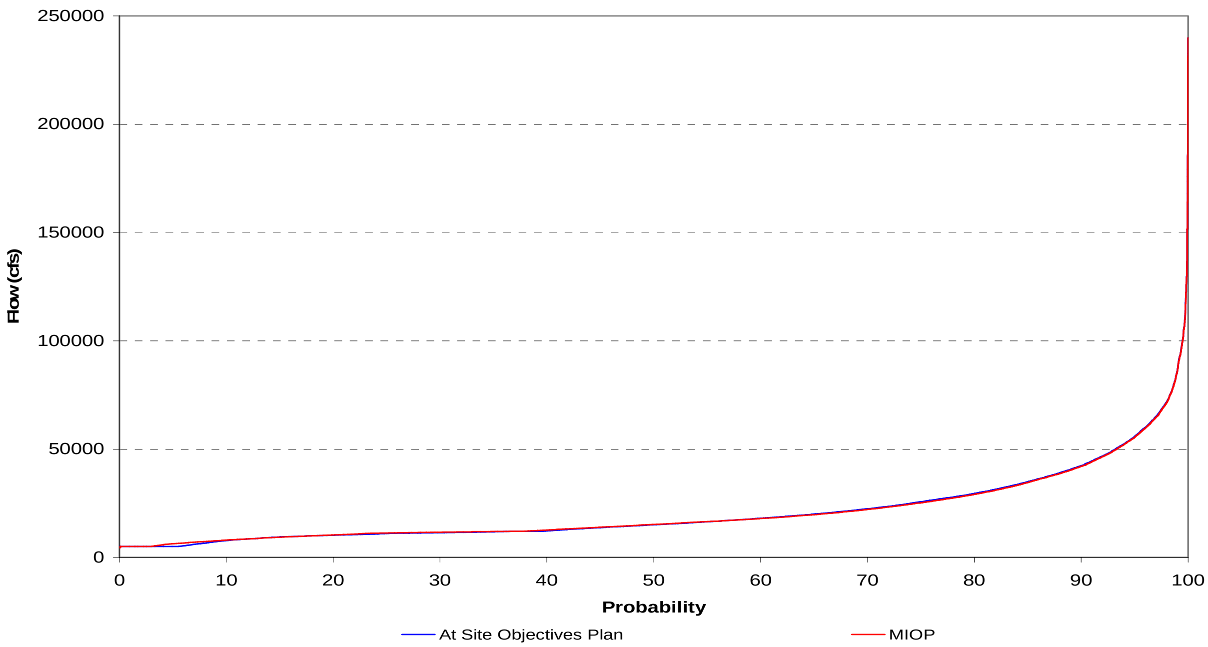

Figure 6. Flow at the Chattahoochee gage under MIOP as compared to flow under the "At Site Objectives" Operating plan.

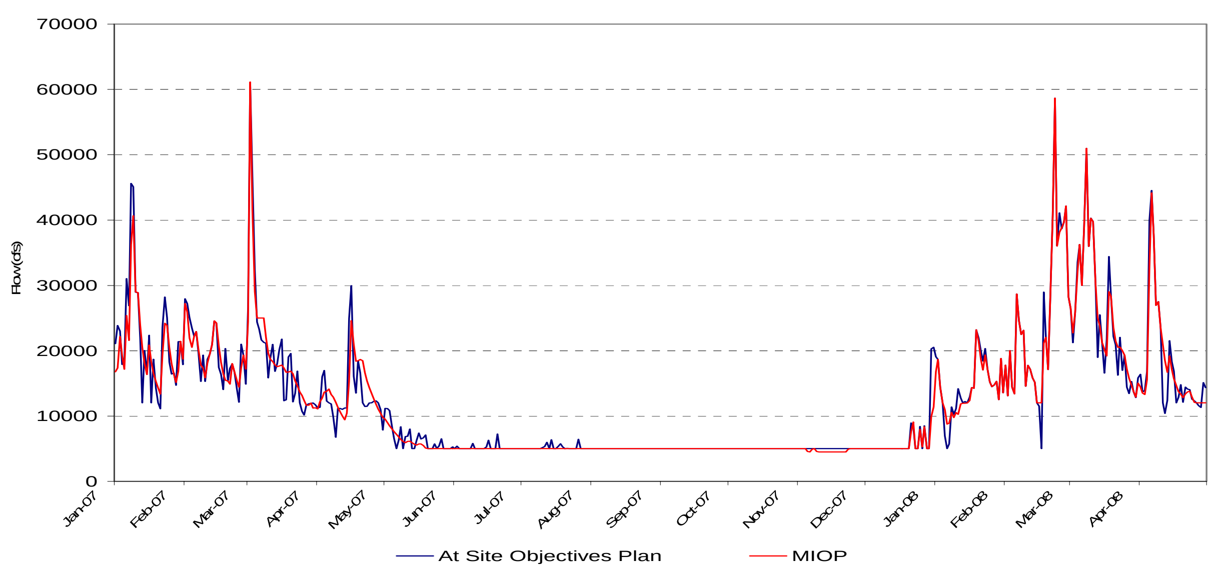

Figure 7. Simulated flow under MIOP and At-Site Objectives Operating Plan from January 2007 to April 2008

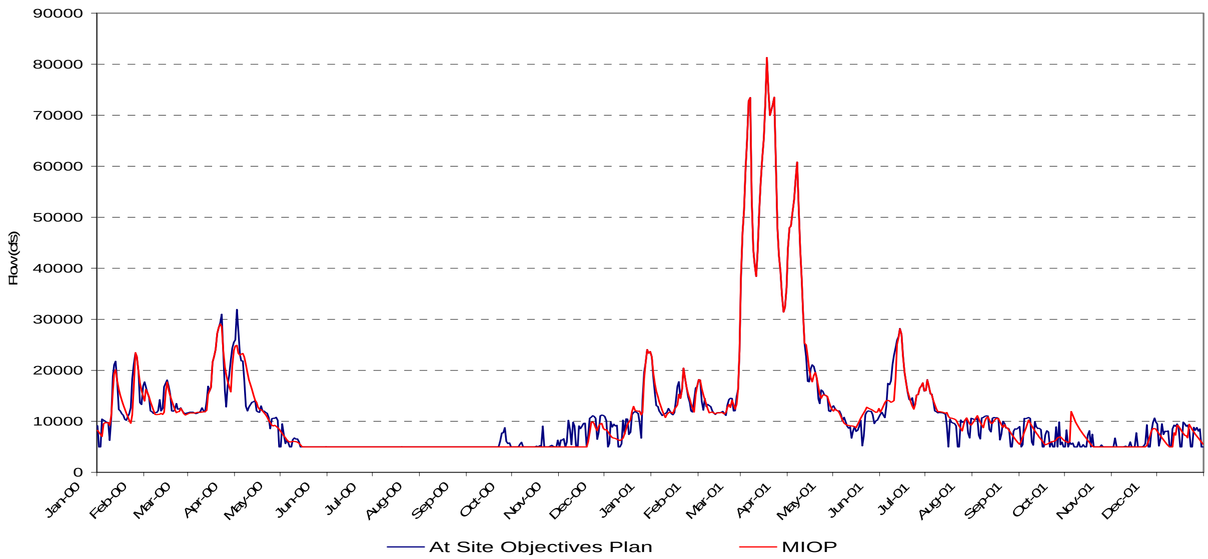

Figure 8. Simulated flow under MIOP and At-Site Objectives Operating Plan from December 1999 to December 2000

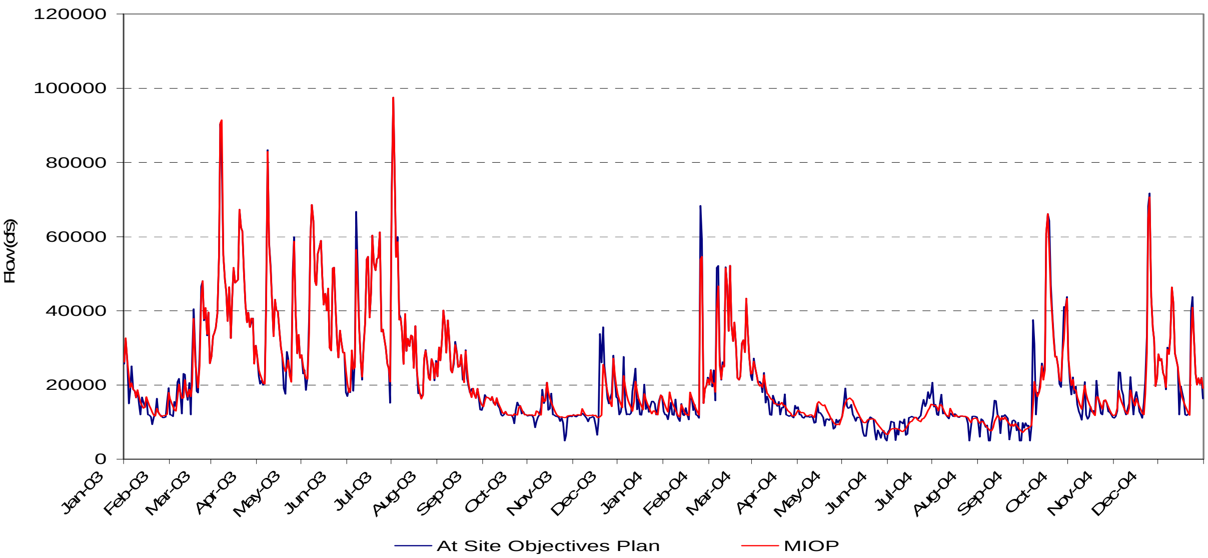

Figure 9. Simulated flow under MIOP and At-Site Objectives Operating Plan from January 2003 to December 2004

2.2 Lanier Should Not be Drawn Down Excessively Because Lanier Takes a Very Long Time to Refill

A second consequence of the geography of the ACF Basin—with Lake Lanier at headwaters, controlling just 5.6% of the drainage area of the basin—is that it takes a very long time to refill Lake Lanier once it is drawn down.

Figure 10 shows the average annual inflow (acre-feet per year) into each of the three storage reservoirs. 0 provides similar statistics in a different form. The table shows, for example, that the drainage-to-storage ratio for West Point is 100 times greater than that for Lake Lanier. 0 further shows that it would take 279 days to fill Lake Lanier *if the entire flow of the river (based on the annual average flow) were captured and stored.* This statistic is provided for purposes of comparison only—in reality it would take much longer than 279 days to refill Lanier because it will never be possible to capture and store 100% of the inflow to this reservoir.

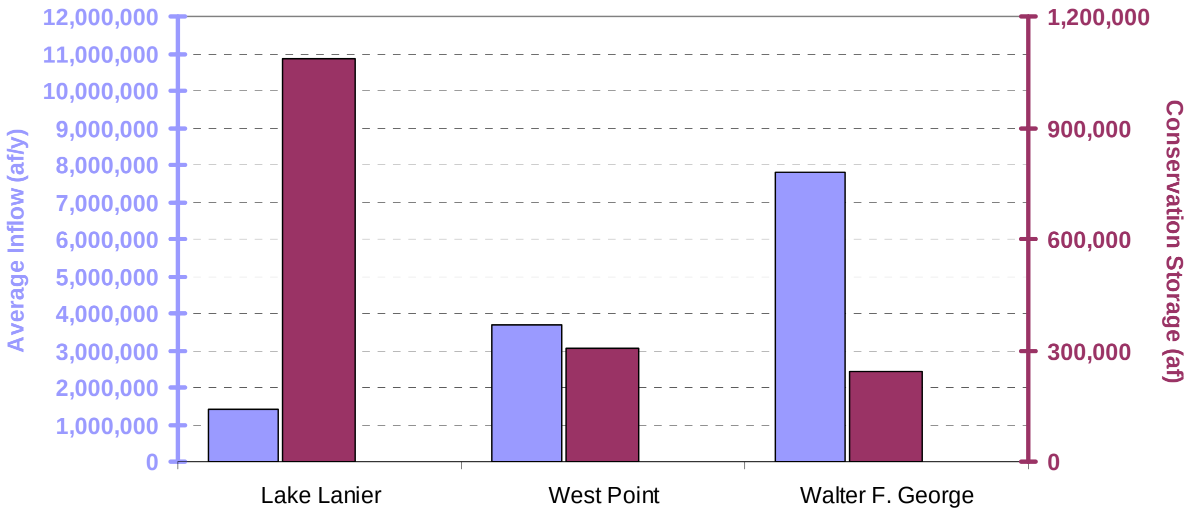

Figure 10. Average daily inflow (acre-feet per year) and conservation storage for ACF Reservoirs.

Table 2. Drainage-to-storage and inflow-to-storage ratios for the ACF Storage Projects. The Inflow-to-storage ratio is the total conservation storage divided by average daily inflow in acre-feet.

	Lake Lanier	West Point	Walter F. George	George Andrews	Lake Seminole
Drainage-to-storage ratio	.0001	.0112	.0305	n/a	.2578
# of Days to Fill Conservation Storage Assuming Zero Releases and Inflow Equal to Average Annual Inflow	279	30	11	n/a	n/a

The events of 2007 illustrate the effect on Lanier's very small drainage-to-storage ratio. Figure 11 through Figure 13 show the actual, recorded levels for West Point, Walter F. George and Lake Lanier from June 2007 to May 2008. These Figures show that West Point and W.F. George responded almost immediately to the rains that began in November 2007. Even with reduced releases from Buford Dam, these reservoirs, which had been at the bottom of Zone 4, refilled completely by mid-January. In fact, both reservoirs are now *over* full, as defined by the "top of conservation" line in the graphs. In sharp contrast, Lanier is still fifteen feet below rule-curve—a record low for this time of year—and the level is projected to fall even further for the rest of the year.

Figure 11. West Point Lake Levels from June 2007 to May 2008

Figure 12. Walter F. George Lake Levels from June 2007 to May 2008

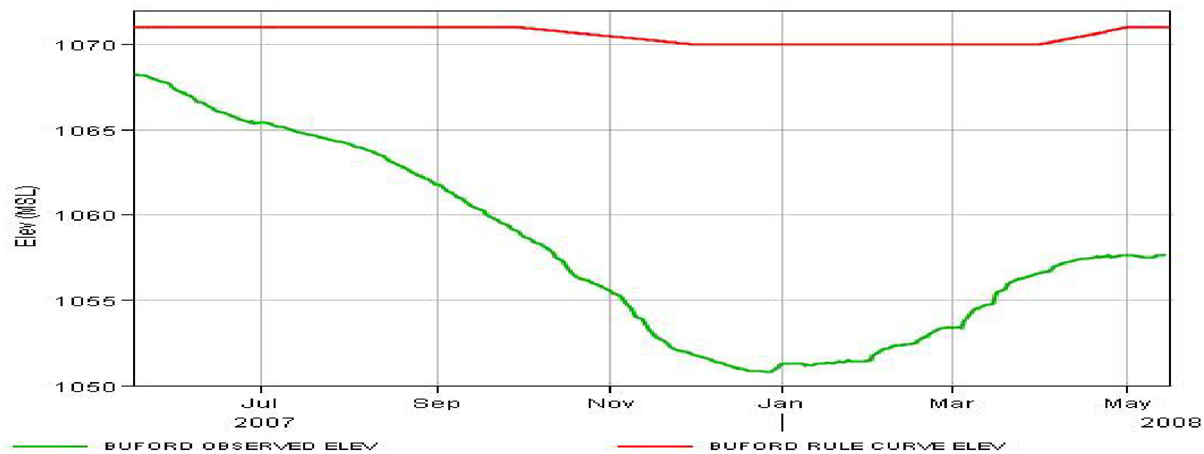

Figure 13. Lake Lanier Lake Levels from June 2007 to May 2008

2.3 The Costs to North Georgia Far Outweigh the Limited Benefits that Can be Achieved by Draining Lake Lanier to Manipulate Flows in the Apalachicola River

The very long time it takes to refill Lake Lanier, coupled with the limited benefits that can be achieved, weigh heavily against any attempt to use storage in Lake Lanier to manage flows in the Apalachicola River.

2.3.1 Low Lake Levels Have a Substantial, Lasting, Adverse Impact on North Georgia

Low lake levels at Lake Lanier have a profound, negative impact on the economy and general well-being of North Georgia. In the absence of any significant sources of groundwater, the vast majority of the metropolitan area relies on Lake Lanier and on another federal reservoir—Lake Allatoona, in the Alabama-Coosa-Tallapoosa (ACT) River Basin—to meet water needs. Lake Lanier supplies most of the region. Therefore approximately 3.5 million people rely exclusively on Lake Lanier, and on the Corps, to provide water supply for municipal and industrial purposes.

Low lake levels threaten the security of the water supply for 3.5 million people and for the businesses and industries within the ACF River Basin. This risk is very real, and the magnitude of the potential catastrophe resulting from an empty reservoir can hardly be over-stated.

In addition, costs to North Georgia have already been and will continue to be extremely high. Water restrictions have already had a catastrophic effect on the urban agricultural industry, a large part of Georgia's economy with more than 7,000 businesses employing a workforce of some 80,000 Georgians. Urban agriculture contributes more than $8 billion in annual sales to the state's economy. Numerous business have failed and thousands of jobs have been lost within this industry alone. According to research by the University of Georgia, losses to Georgia's urban agriculture industry due to the recent drought—and in large part due to water restrictions necessitated by the mismanagement of Lake Lanier—are approximately $262 million per month. This translates to an annual loss of $3.14 billion if current conditions and restrictions continue.

The $5.5 billion recreation economy supported by Lake Lanier has suffered as well. Low water levels have led to out-of-service boat ramps, unusable beaches, impassable channels and unusable private docks. These impacts are real and have economic implications for residents, business and governments of Gwinnett, Forsyth, Hall and surrounding counties, and for millions of visitors who normally come to Lake Lanier as a recreation destination.

Local governments are suffering as well. Water utilities have had to adopt extreme response measures on an emergency basis to respond to the precipitous decline in levels at Lake Lanier. In addition to disrupting the lives and businesses of their customers, these emergency measures have cost the metropolitan area Water Supply Providers over $60 million to date. This lost revenue has created substantial difficulties for local governments and authorities whose rate structures and bond financing depend upon predictable revenues.

In sum, the costs to North Georgia, both immediate and potential, far outweigh the trivial benefits that can be achieved by attempting to use Lake Lanier to manipulate flows in the Apalachicola River 350 miles downstream.

2.3.2 The Corps Should Not Rely on Dead Storage to Supply Basic Needs

Florida suggests Lake Lanier should be drawn down below the level of "inactive storage." This is unconscionable. The Corps should not gamble with the health and safety and well-being of 3.5 million people. Lanier should never be drawn down into the dead pool, or even near it.

2.3.3 Contrary to Florida's Allegations, Water Use in the Metro Area is Not the Cause of Any Problems that Might Be Occurring in the Apalachicola River

The State of Florida has complained that the Corps has not done enough to limit depletions in the upper part of the basin. Once again, however, Florida's accusations have little basis in reality, which is that depletions in the upper basin are too small to have any significant impact on the flow of the Apalachicola River.

Notwithstanding our near-total reliance on Lake Lanier for water supply, the entire metropolitan area consumptive use is just 250 cfs per day on average, which is just 1.2% of the average annual flow of the Apalachicola River at the Chattahoochee gage (at the Florida-Georgia line). Metro-area consumption rises in relation to river flow in drought years—but even then the net loss to the basin is just 2% of the annual flow. In other words, if all consumption stopped, and if the river were allowed to pass through North Georgia without any withdrawals or diversions of any kind, the flow of the river at the Florida line would increase at most 2%.

This is a function of the geography discussed above. Because Lake Lanier controls only 9% of the total flow of the basin above the Florida line, 91% is geographically inaccessible to the metro area. In reality, of course, we use only a fraction of the flow that is actually accessible to us, and we return the majority of the water withdrawn. That is why our total impact is on the order of just 1 to 2%.

To put this in perspective, metropolitan Atlanta's average consumptive use of 250 cfs corresponds to approximately 1.8 inches in river stage at the Chattahoochee gage in the Apalachicola River at the river's lowest flow. This in a river that fluctuates wildly, often as much as 2 feet per day as a result of hydropower operations. *See* Figure 14.

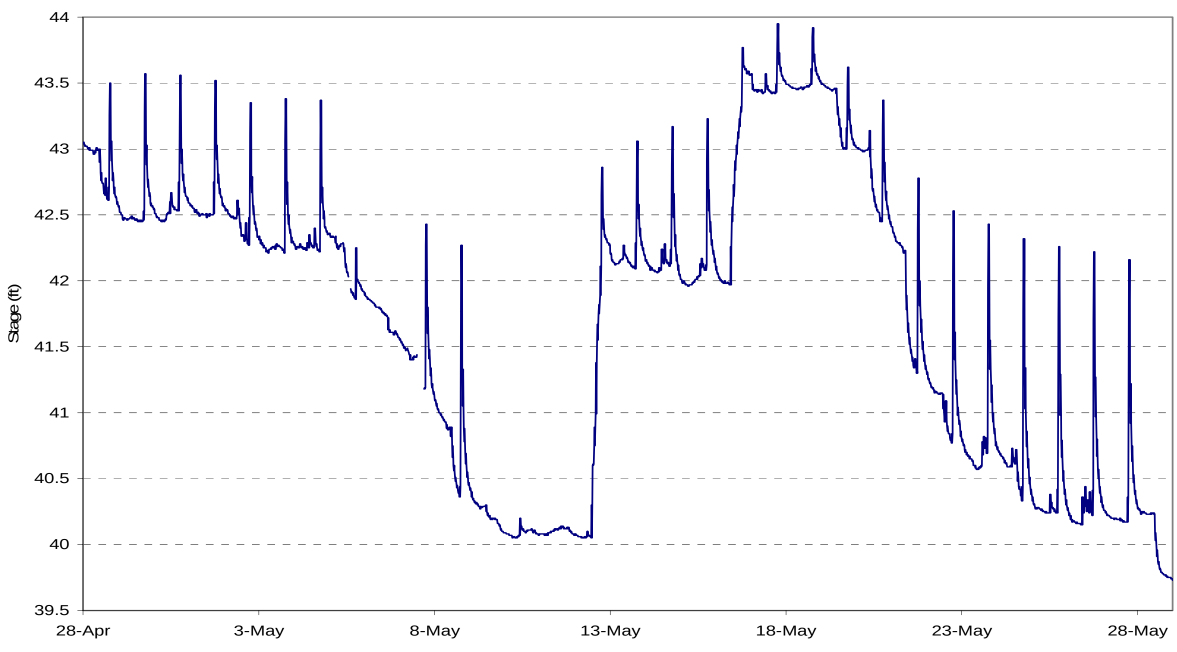

Figure 14. Apalachicola River stage at Chattahoochee gage from April 28, 2008 to May 29, 2008.

Furthermore, although it is true that our withdrawals vary seasonally, the average annual use is the appropriate point of comparison from which to assess impacts to the Apalachicola River, given the availability of reservoir storage in Lake Lanier. The use of storage helps to "smooth out" seasonal variations in withdrawals. Water that is withdrawn from storage affects stream flow when it is taken from the stream and placed into storage—usually in the winter or spring—and not when it is it is withdrawn from the reservoir.

Moreover, Metro Atlanta is not even biggest user in the ACF Basin. Consider the following:

- Depletions to the Flint River due to agricultural irrigation in South Georgia average approximately 268 mgd (415 cfs), which is about 66% more than metro Atlanta's net water consumption. Total agricultural withdrawals for irrigation are even higher. The number cited above is the total depletion of surface waters in the Flint River due to the combination of surface and groundwater withdrawals.

- Evaporation from the mainstem reservoirs alone causes depletions of approximately 135 mgd (209 cfs).

2.4 The State of Florida and the Corps Must Acknowledge and Address the Real Causes of Environmental Issues in the Apalachicola River and Bay

Instead of pointing fingers at the metro area, the State of Florida and other stakeholders should acknowledge that many of the issues in the Apalachicola River are being caused by factors unrelated to reservoir operations or water withdrawals.

To the extent Florida is concerned about salinity in Apalachicola Bay, for example, Florida and the Corps should be studying ways to solve the problems created by Sikes Cut, which is a major contributor to salinity in the bay. Florida should also study the issues created by inter-basin transfers out of the lower Chipola River, such as the Gulf County Canal that is used to transport water to Port St. Joe.

Similarly, to the extent Florida and the Corps are concerned about the areal extent of flooding or the amount of certain types of habitat that are inundated, Florida and the Corps must acknowledge that real causes of these problems have more to do with channel degradation than with the quantity of flow in the river. USGS has documented the effect of channel degradation in the Apalachicola River, which has substantially lowered the bed of the river in key places, such as the sturgeon spawning area at River Mile 105.5. *See Figure 15.* This is highly significant because many of the environmental issues in the Apalachicola River, and especially those related the Gulf sturgeon and mussels, have more to do with the areal extent of flooding or inundation as opposed to the quantity of flow *per se*. As a result of the lowering of the channel, it now takes much more water to achieve any given river stage. At the principal spawning ground for the sturgeon, RM 105.5, USGS has determined that an additional 10,000 cfs is required to raise the river its former stage. This is *40 times* the average annual consumptive use of the entire metropolitan area (250 cfs). *See Helen R. Light, Water Level Decline in the Apalachicola River, Florida, from 1954 to 2004, and Effects on Floodplain Habitats (USGS Scientific Investigations Report 2006-5173) at 25, Figure 13.*

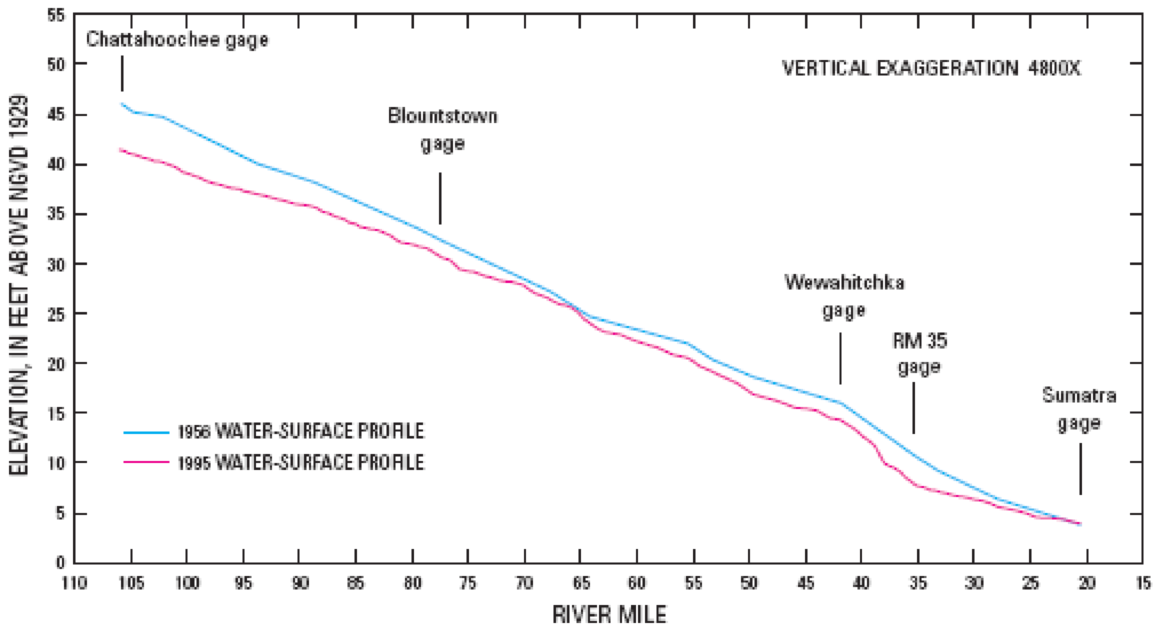

Figure 15. Channel degradation in the Apalachicola River, from Helen R. Light, Water Level Decline in the Apalachicola River, Florida, from 1954 to 2004, and Effects on Floodplain Habitats (USGS Scientific Investigations Report 2006-5173) at 9 (Figure 4).

Likewise, the Apalachicola River appears to be migrating to the Chipola Cut-off, a man-made diversion that is claiming up to 40% of the flow of the mainstem of the river, according to the most recent statistics. This diversion is partially responsible, along with other factors such as the build-up of sediment at the head of the slough—for the dewatering of Swift Slough in 2006 and 2007. Water-use in the metro area pales in comparison to the amount diverted by this artificial cut-off. *See Figure 16.*

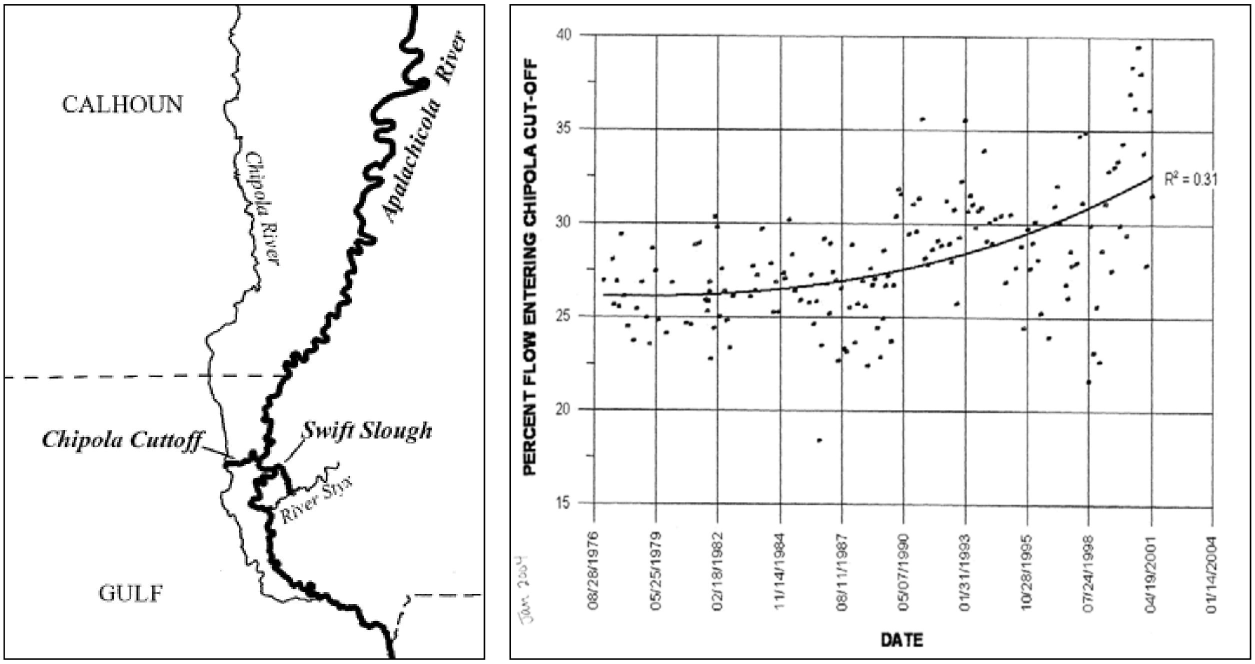

Figure 16. Percentage of the Main Channel of the Apalachicola River Entering Chipola Cutoff from 1976 to 2004. From Administrative Record in State of Georgia v. U.S. Army Corps of Engineers (M.D. Fla. 07-cv-1) GAII001733.

All parties should also acknowledge the role played by agricultural users in South Georgia. According to statistics prepared by the State of Georgia, the average annual streamflow depletion caused by agricultural irrigation is 415 cfs, compared to 250 cfs for the entire metropolitan area. *See* Exhibit E. Unlike the metro-area withdrawals, which are taken from storage, agricultural withdrawals from the Flint River Basin have an immediate effect on stream flows. Operating plans that require the Corps to meet a fixed, minimum flow at the Chattahoochee gage effectively require the Corps to use reservoir storage to compensate for such depletions. Without questioning whether the Corps is legally authorized to utilize reservoir storage to facilitate irrigation, it seems clear that the Corps cannot be *required* to do so under the Endangered Species Act.

These are all real problems that cannot be corrected by curtailing water withdrawals or by simply manipulating reservoir operations. These issues need to be acknowledged and addressed by the stakeholders and by the Corps.

3. Conclusion

In conclusion, we urge you to consider further modifications to the MIOP to eliminate its more apparent flaws. More generally, however, the IOP/MIOP is a misguided and futile effort to use reservoir storage to solve environmental issues in the Apalachicola River. The potential benefits of this effort to the Apalachicola River are negligible and are far outweighed by costs to users who rely on storage. Therefore the IOP/MIOP should be set aside at the first opportunity. It should not be the starting point for new ACF Water Control Plan.

Thank you once again for your efforts. Please do not hesitate to call if you have any questions about these comments or if we can assist in any way.

Sincerely,

Pat Stevens, Chief
Environmental Planning

EXHIBIT A

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MEMO

To:
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Lewis Jones, King & Spaulding LLP

Copies:
Daniel Sheer, HydroLogics, Inc
A. Michael Sheer, HydroLogics, Inc

From:
Megan Rivera, HydroLogics, Inc

Date:
May 29, 2008

Subject:
HEC 5 Emulation with OASIS

To verify the initial version of the OASIS Apalachicola-Chattahoochee-Flint model, a HEC-5 model of operations in the 1980s and 1990s was emulated. The HEC-5 run was built by Dr. George McMahon, and the cards for the run are provided at the end of this appendix. A comparison of the OASIS and HEC-5 output is provided below.

Figures 1 to 4 show the stages in the reservoirs generated by both models. Overall, there is very close agreement. The discrepancies are discussed below.

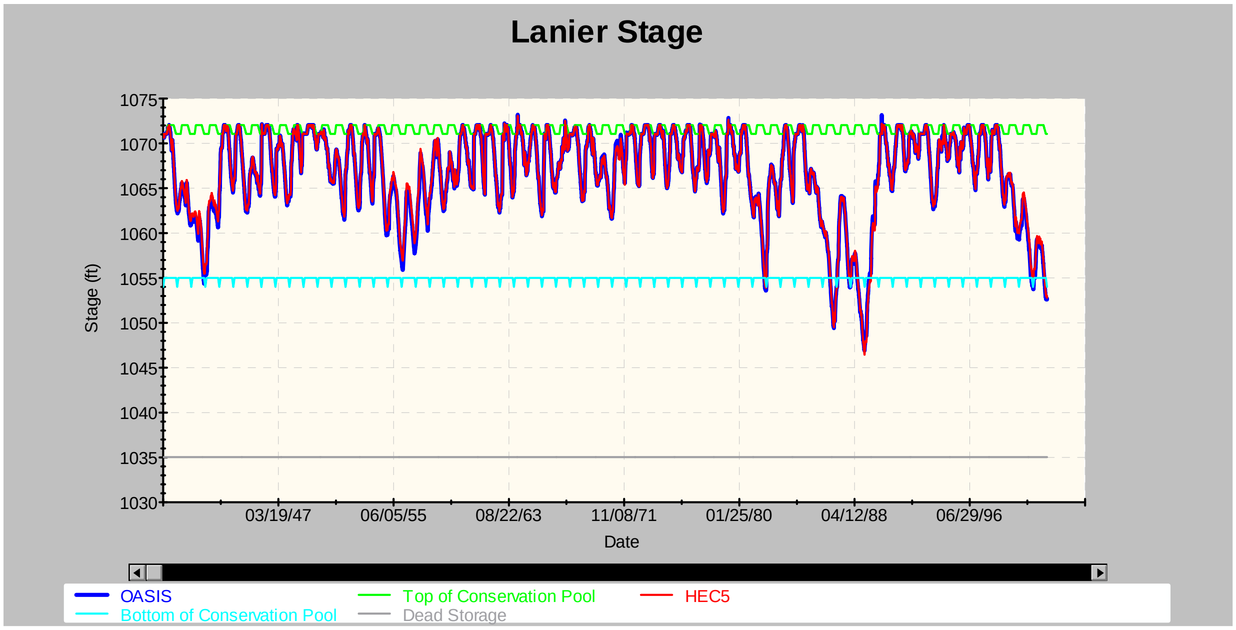

Figure 1. Stages in Lanier.

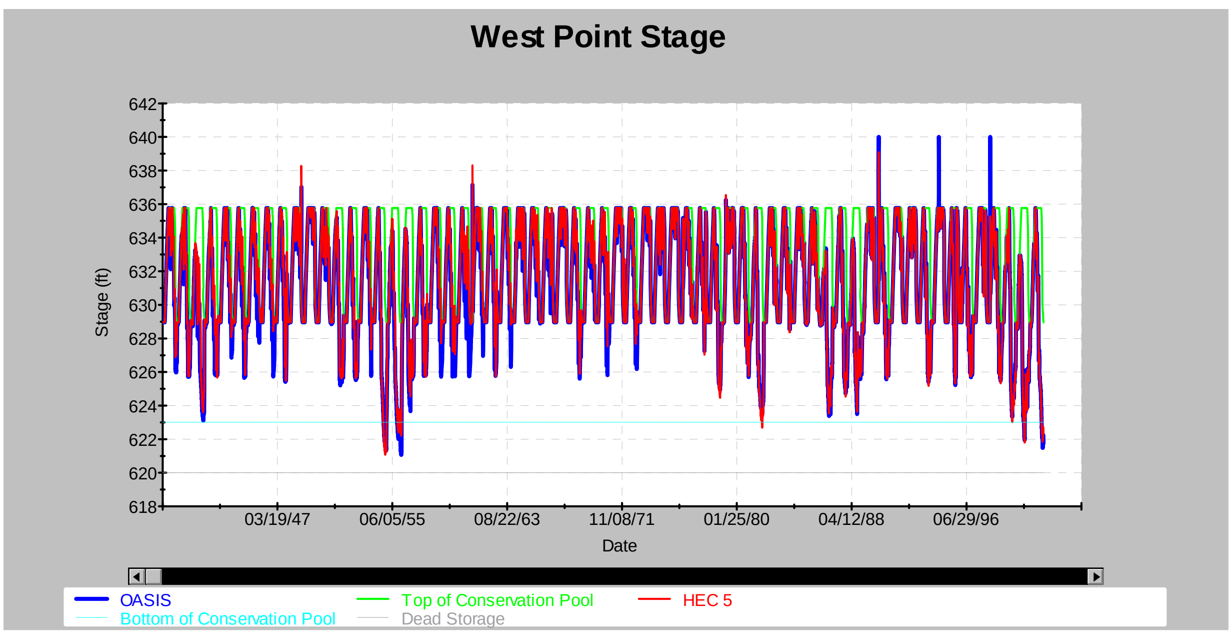

Figure 2. Stages in West Point.

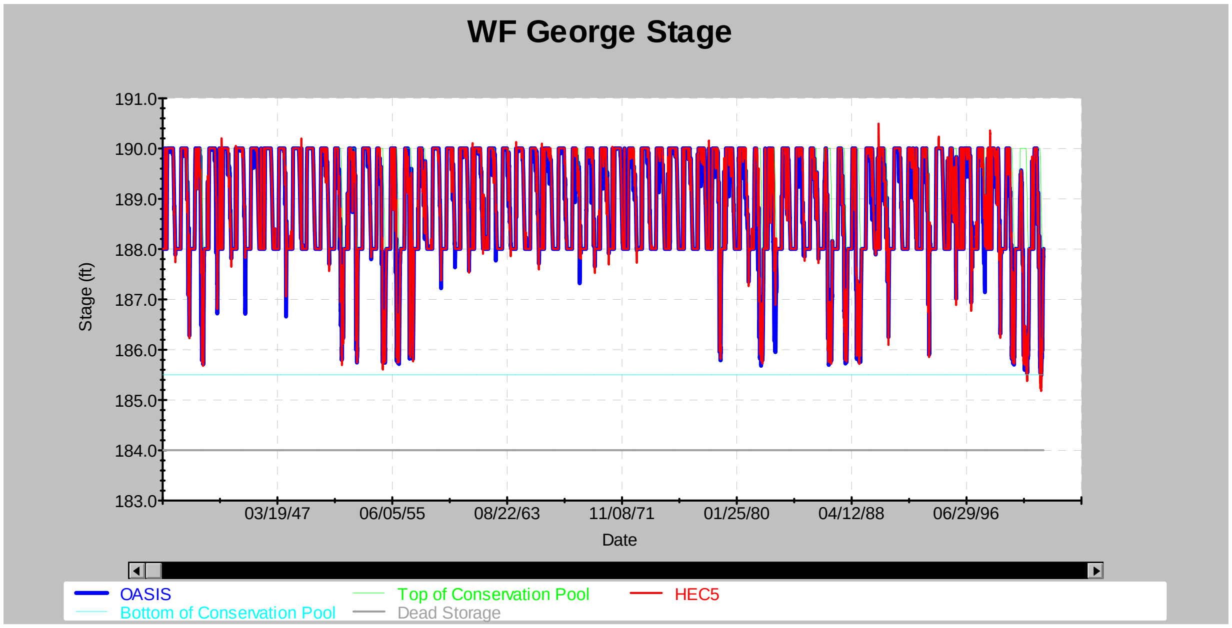

Figure 3. Stages in Eufala

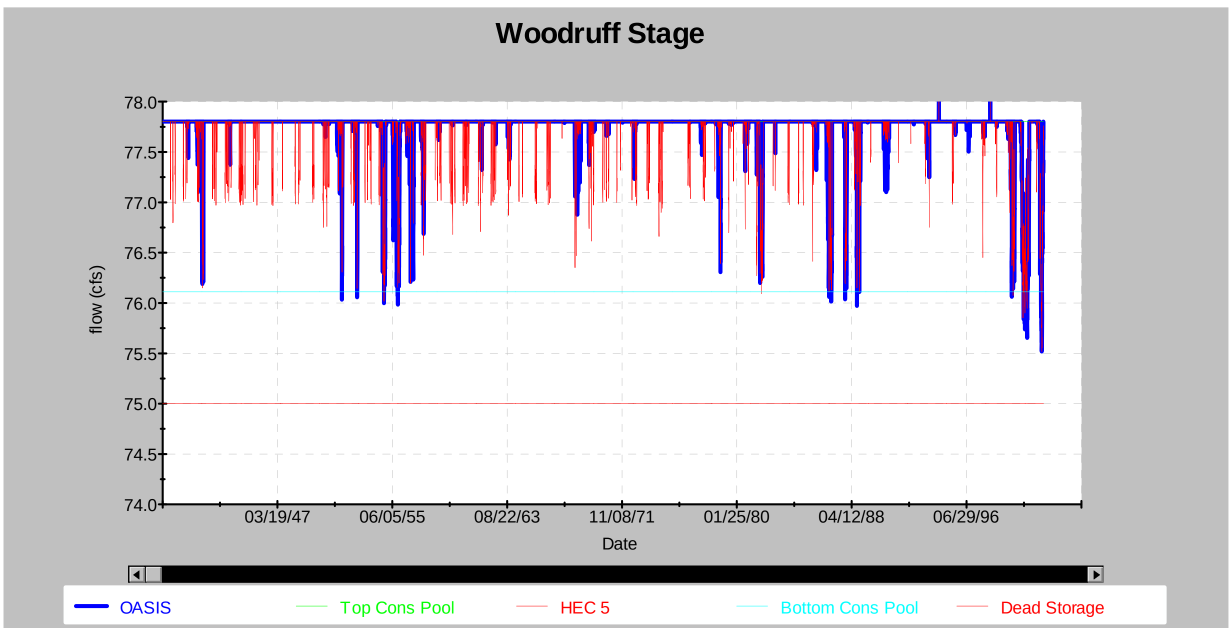

Figure 4. Stages is Woodruff

Disagreements

1. OASIS's calculation of generated power tends to be slightly higher than that of HEC-5 by about 1% . The difference results from the linearization of head loss from tail water rise: OASIS uses a mean efficiency value, which does not capture the functional relationship exactly. As a result, the flows out of Buford to meet the power requirement are slightly lower in OASIS, as it takes slightly less water to meet the power requirements. This can be seen in Figure 5.

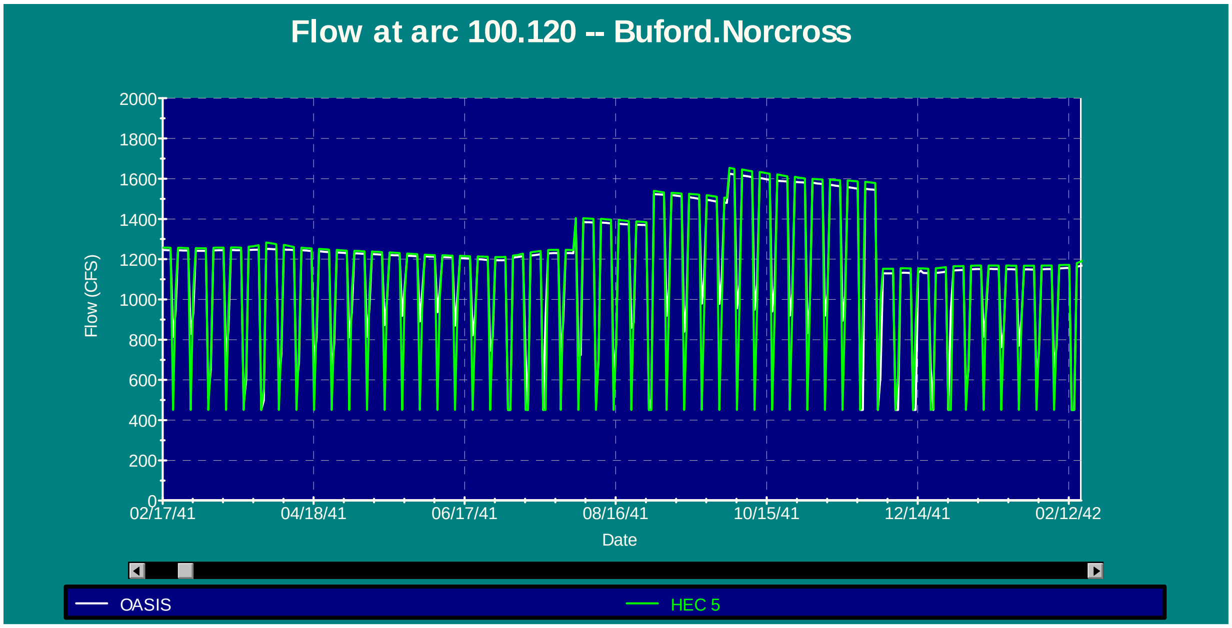

Figure 5. Releases from Buford.

2. OASIS will keep Morgan Falls above its lower rule as long as Lanier is above the bottom of conservation pool. This results in higher flows out of Buford on the weekends, which puts Lanier storage slightly lower in OASIS compared to HEC-5 at times. The effect accumulates slowly until refill, as seen in Figure 6, for example. On the other hand, when Lanier is below its conservation pool, OASIS brings Morgan Falls down to dead storage, resulting in lower storage in Lanier for OASIS, as seen in Figure 7.

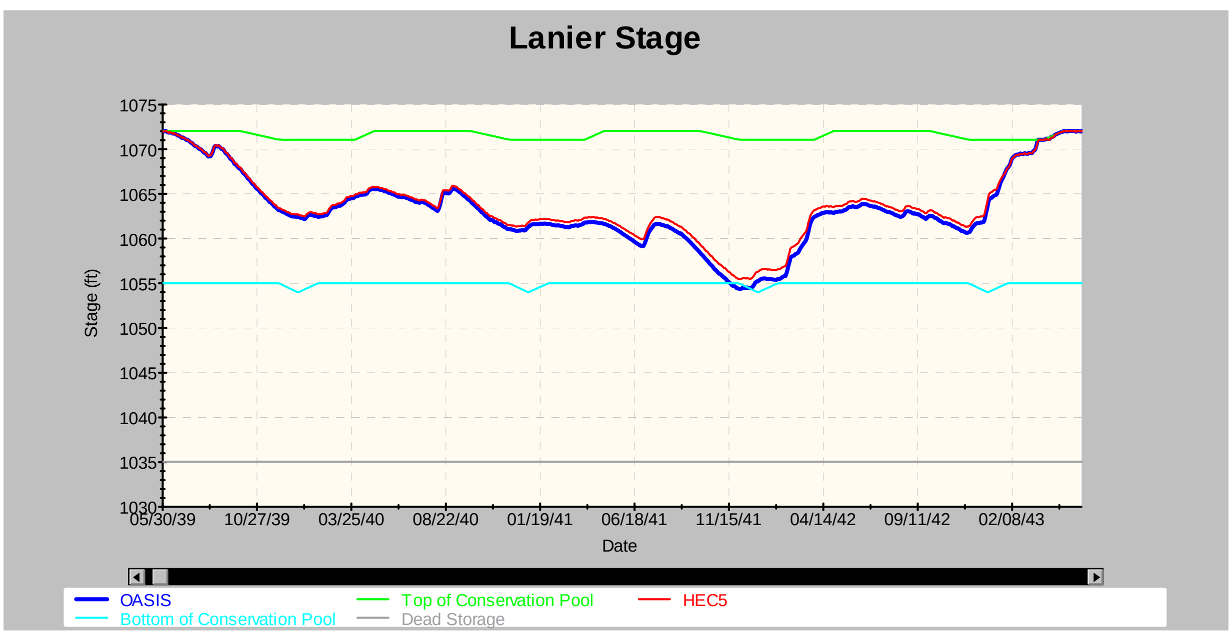

Figure 6. Stages in Lanier during a time in which OASIS results are slightly lower than those in HEC-5

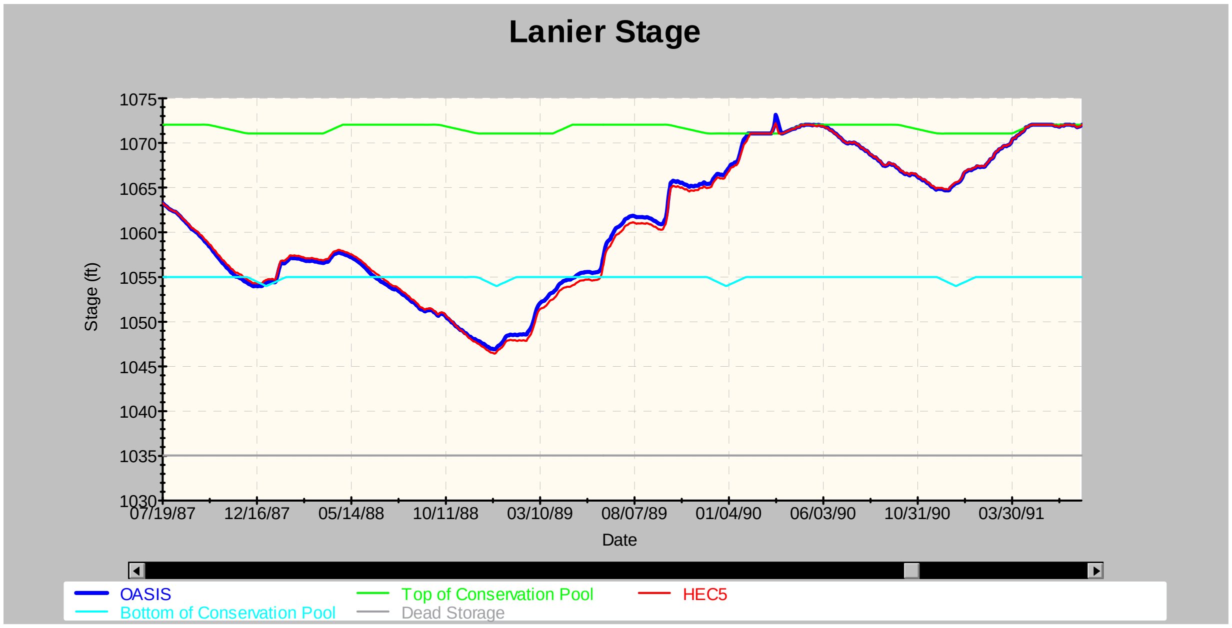

Figure 7. Stages in Lanier during a time in which OASIS results are slightly higher than those in HEC-5

3. OASIS does not always draw down Woodruff when HEC 5 does (see Figure 4). This is a small amount of water, so matching operations at Woodruff exactly was not refined.

Short term disagreements

1. During large rain events, OASIS will hold water in upstream reservoirs to respect downstream canal capacities (specifically, maximum flow constraints downstream of WF George). HEC-5 will hold water in WF George only, while OASIS holds water in West Point and Lanier as well. This difference manifests as temporary storage increases in WF George only in HEC-5, and WF George and West Point in OASIS (e.g., Dec 1948, Figures 8 and 9). This also causes discrepancies in flows (OASIS does not make Buford power requirement on 3/2-8/2001 to avoid additional flooding downstream, for example).

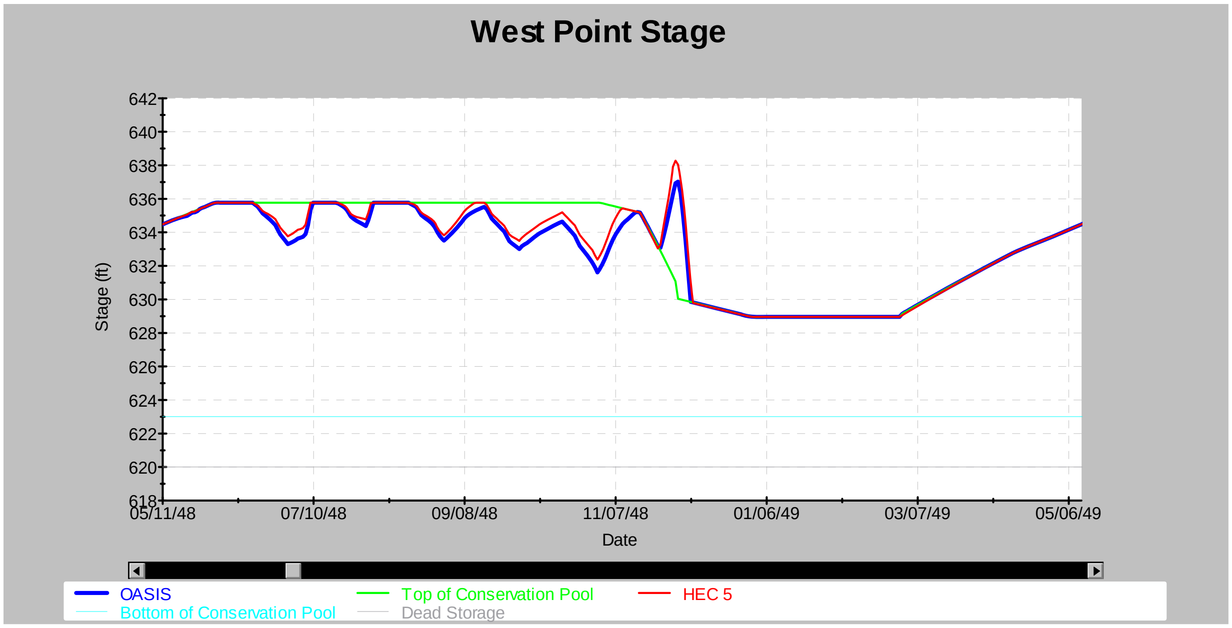

Figure 8. Stages in West Point during a flooding event

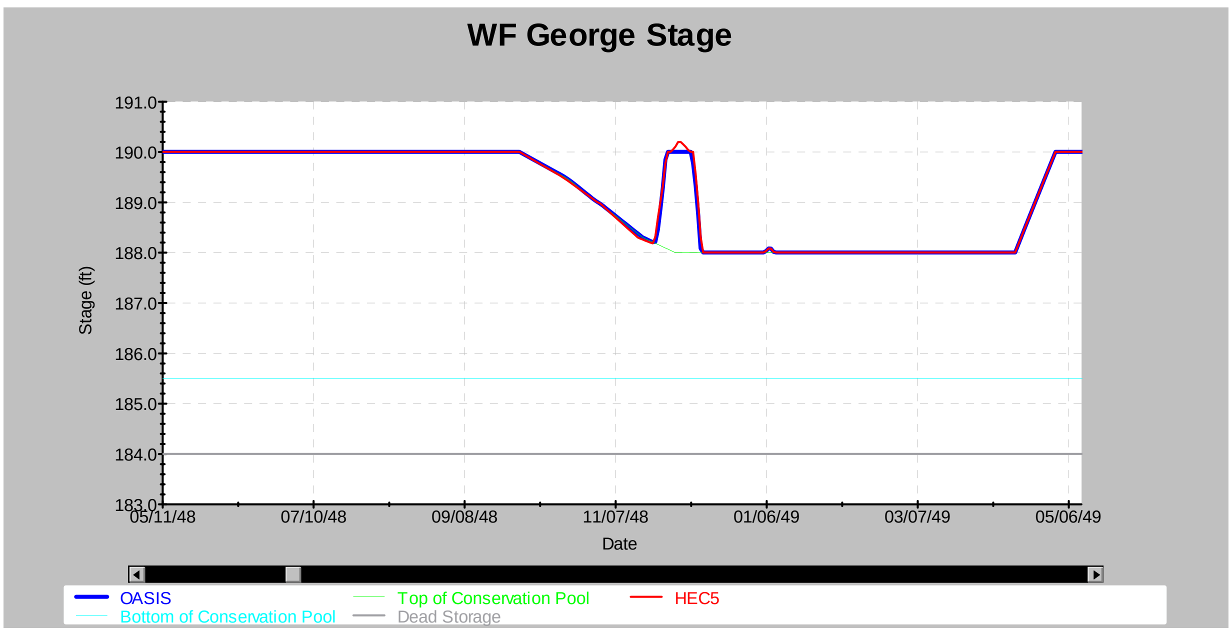

Figure 9. Stages in WF George during a flooding event

2. When the models are attempting to meet seasonal min flows at Woodruff, HEC-5 oscillates between the min flow value on the cards (13,000 cfs) and 21,000 cfs, as shown in Figure 10. There is no 21,000 cfs in the cards, and required power does not spike in that way, so this behavior was not emulated.

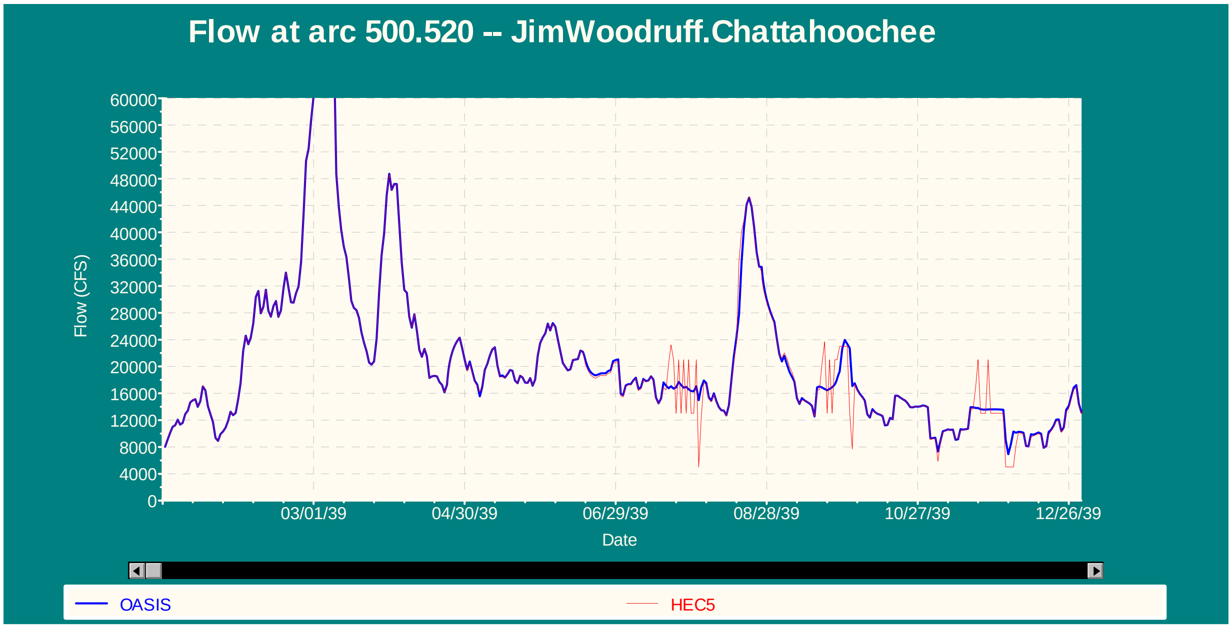

Figure 10. Woodruff releases in 1939.

The HEC-5 cards for the emulated run (FEA2000B) are given below.

```
C   ***********************************************************************
C                    ACF EXISTING CONDITIONS
C   ***********************************************************************
C
C  MODEL BASED ON FBE08017.DAT HEC-5 DATA SET, 01 AUG 1997
C  USING HEC-5 EXECUTABLE DATED 16JUN97
C
C  GFM: FEA2000 - 2000 DIVERSIONS ABOVE WHITESBURG
C       BASED ON GA EPD 2000 DATA WITH 58% RETURNS (FEADEM.XLS)

T1  ACT - ACF COMPREHESIVE STUDY SURFACE WATER ELEMENT
T2  MODEL TO SIMULATE THE ACTUAL ACF RESERVOIR OPERATION PRACTICED DURING
T3  THE 1980'S AND 1990'S.
J1      0       1       5       3       4       2       0       0       1
J2     48       1              22       0       0       0
J3      4               0       0       0      -1      23       0       0
C
C FOLLOWING IS A LIST OF LOCATIONS WITHIN THE MODEL AND
C THE NUMBER IDENTIFICATIONS ASSOCIATED WITH EACH LOCATION
C  225 BUFORD          222  NORCROSS     221 MORGAN FALLS   220 ATLANTA
C  217 WHITESBURG
C  215 WEST POINT      214 WEST PT GAGE  213 LANDALE DAM    212 RIVER VIEW DAM
C  211 BARTLETS FERRY 210 GOAT ROCK      209 OLIVER DAM     208 NORTH HIGHLANDS
C  207 CITY MILLS      206 EAGLE & PHENIX205 COLUMBUS GAGE 200 WALTER F GEORGE
C  196 JIM WOODRUFF    194 CHATTAHOOCHEE 192 BLOUNTSTOWN    185 SUMATRA
C  360 GRIFFIN         350 MONTEZUMA     340 ALBANY DAM     330 NEWTON
C  AS A RESULT OF ADDING ROUTINGS TO MOST REACHES AND USING INCREMENTAL
C  FLOWS THE ENVIRONMENTAL SITES HAVE BEEN REMOVED FROM THE MODEL
C

C   ** OUTPUT DESCRIPTORS TO DSS **

C  .01 FLOW-LOC CUM   .02 FLOW-NAT      .04 FLOW REG      .09 FLOW-RES IN
C  .03 FLOW DIVERSION .04 FLOW REG      .05 FLOW DESIRED .06 FLOW-DES SHORTAGE
C  .07 FLOW REQUIRED  .08 FLOW-REQ SHORTAGE                .09 FLOW-RES IN
```

```
C  .10 FLOW-RES OUT   .11 STOR-RES EOP .12 CASE-RES      .13 LEVEL-RES
C  .15 ENERGY-REQ     .16 ENERGY-GEN   .21 EVAP-NET      .24 FLOW-LOC INC
C  .17 FLOW-CHAN CAP  .21 EVAP-NET     .22 ELEV          .23 ENERGY-SHORTAGE
C  .25 POWER
C  .26 ENERGY-SYS REQ .30 FLOW-DIV REQ  .31 FLOW-DIV SHOR  .35 PLANT FACTOR
C  .37 PCT STR NORM

C HYDROPOWER RESERVOIR OUTPUT
C 225=BUFORD
JZ225.09  225.10  225.12  225.37  225.22  225.13  225.15  225.16  225.23
225.25
JZ225.33  225.35  225.38  225.03  225.30  225.31
C 221=MORGAN FALLS
JZ221.09  221.10  221.12  221.37  221.22  221.13  221.15  221.16  221.23
221.25
JZ221.33  221.35  221.38  221.03  221.30  221.31
C 215=WEST POINT
JZ215.09  215.10  215.12  215.37  215.22  215.13  215.15  215.16  215.23
215.25
JZ215.33  215.35  215.38  215.03  215.30  215.31
C 211=BARTLETS FERRY
JZ211.09  211.10  211.12  211.37  211.22  211.13  211.15  211.16  211.23
211.25
JZ211.33  211.35  211.38  211.03  211.30  211.31
C 200=WALTER F. GEORGE
JZ200.09  200.10  200.12  200.37  200.22  200.13  200.15  200.16  200.23
200.25
JZ200.33  200.35  200.38  200.03  200.30  200.31
C 196=JIM WOODRUFF
JZ196.09  196.10  196.12  196.37  196.22  196.13  196.15  196.16  196.23
196.25
JZ196.33  196.35  196.38  196.03  196.30  196.31  196.17

C RUN-OF-RIVER RESERVOIR OUTPUT
C 210=GOAT ROCK DAM  209=OLIVER DAM  208=NORTH HIGHLANDS DAM
JZ210.09  210.10  210.12  210.22  209.09  209.10  209.12  209.22
JZ208.09  208.10  208.12  208.22

C  NODES AND DUMMY RESERVOIRS WITH MINIMUM FLOW REQUIREMENT
C 220=ATLANTA 214=WEST POINT GAGE 205=COLUMBUS 192=BLOUNTSTOWN
C 215=WEST POINT DAM 200=W.F.GEORGE 296=ONEFOOT BELOW WOODRUFF
JZ220.03  220.04  220.05  220.06  220.07  220.17  220.24  220.30  220.31
JZ214.03  214.04  214.05  214.06  214.07  214.17  214.24  214.30  214.31
JZ205.03  205.04  205.05  205.06  205.07  205.17  205.24  205.30  205.31
JZ200.05  200.06  215.05  215.06
JZ296.04  296.05  296.06
JZ192.03  192.04  192.05  192.06  192.07  192.17  192.24  192.30  192.31

C NODES AND DUMMY RESERVOIRS WITHOUT MINIMUM FLOW REQUIREMENT
C 222=NORCROSS 217=WHITESBURG 199=GEORGE ANDREWS
C 360=GRIFFIN 350=MONTEZUMA 340=ALBANY 330=NEWTON 320=BAINBRIDGE
C 194=CHATTAHOOCHEE 185=SUMATRA
JZ222.03  222.04  222.24  222.30  222.31
JZ217.03  217.04  217.24  217.30  217.31
C JZ214.03  214.04  214.24  214.30  214.31
JZ199.03  199.04  199.24  199.30  199.31
JZ360.03  360.04  360.24  360.30  360.31
JZ350.03  350.04  350.24  350.30  350.31
JZ340.03  340.04  340.24  340.30  340.31
JZ330.03  330.04  330.24  330.30  330.31
JZ320.03  320.04  320.24  320.30  320.31
JZ194.03  194.04  194.24  194.30  194.31
JZ185.03  185.04  185.24  185.30  185.31
```

```
C NOLIST
C
C **************** BUFORD DAM (LAKE LANIER) ************ RIVER MILE 456.09
C CODED JUNE 8, 1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL (ZONE 4)
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL (TOP OF ZONE 1)
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
RL   225 1957000
RL     1     225      -1          867600
C     ELEVATION                    1035

RL     2     225       9         1369772 1400771 1400771 1400771 1400771
1400771
C     DATE                         01JAN   01FEB   01MAR   31MAR   01MAY   30JUN
C     ELEVATION                    1054     1055    1055   1055     1055    1055
C   STORAGES AND ELEVATIONS HAVE BEEN ADJUSTED TO REPRESENT 1980S EVENTS

RL                               1400771 1400771 1369772
C     DATE                         30SEP   01DEC   31DEC
C     ELEVATION                    1055     1055    1054

RL     3     225       9         1957000 1957000 1957000 1957000 1995200
1995200
C     DATE                         01JAN   01FEB   01MAR   31MAR   01MAY   30JUN
C     ELEVATION                  1071.05 1071.05 1071.05 1071.05 1072.03
1072.03

RL                               1995200 1957000 1957000
C     DATE                         30SEP   01DEC   31DEC
C     ELEVATION                  1072.03 1071.05 1071.05
C   LEVEL 3 HAS 40000 AC FT ADDED SO THE ELEVATIONS ARE ABOUT 1-FOOT TOO LOW

RL     4     225      -1         2554000
C     ELEVATION                    1085

RL     5     225      -1         3070000
C     ELEVATION                    1095
RO     1     221
RS   -50       0     760     867     913     960    1009    1059    1085
1112
RS  1139    1166    1194    1222    1251    1280    1309    1339    1370
1401
RS  1432    1464    1496    1529    1561    1595    1629    1663    1698
1733
RS  1769    1805    1842    1879    1917    1955    1994    2034    2074
2114
RS  2155    2197    2239    2282    2326    2370    2415    2461    2554
2800
RS  3070
RQ    50       0    1000    9000    9000    9000    9000    9000    9000
9000
RQ  9000    9000    9000    9000    9000    9000    9000    9000    9000
9000
RQ  9000    9000    9000    9000    9000    9000    9000    9000    9000
9000
RQ  9000    9000    9000    9000    9500    9500    9500    9500    9500
9500
RQ  9500    9500    9500    9500    9500    9500    9500    9500   10000
19000
RQ 45000
```

```
RA    50       0   20508   22442   23217   24008   24833   25701   26159
26619
RA 27079   27535   27983   28432   28861   29291   29721   30153   30587
31023
RA 31461   31901   32343   32789   33238   33690   34147   34610   35079
35555
RA 36036   36522   37015   37515   38024   38542   39078   39638   40226
40833
RA 41458   42086   42716   43348   43982   44618   45256   45896   47182
50250
RA 53300
RE    50     920    1030    1035    1037    1039    1041    1043    1044
1045
RE  1046    1047    1048    1049    1050    1051    1052    1053    1054
1055
RE  1056    1057    1058    1059    1060    1061    1062    1063    1064
1065
RE  1066    1067    1068    1069    1070    1071    1072    1073    1074
1075
RE  1076    1077    1078    1079    1080    1081    1082    1083    1085
1090
RE  1095
P1   225  100000       1       3       0       0      -1       1
C  ACTUAL CAPACITY IS CONSIDERED TO BE 105000 KW BUT 5000KW WILL BE ASSIGNED
C  TO THE 450 CFS LEAKAGE. THIS LEAKAGE IS REALLY THE SERVICE UNIT DISCHARGE
C  120 MWH (5000 x 24) WILL BE ADDEED TO EACH DAY'S ENERGY PRODUCTION OUTSIDE
THE MODEL.
P2   450    8800       0

PC     8       0     .05     .21     .44     .70     .84     .88     1.0
PF     8   .0625   .0625   .0625   .0625   .0833    .125    .167    .208
PR     1       1       1       1       1     1.0     1.0     1.2     1.4
1.6
PR   1.6       1
C PD   0      .2      .2      .2      .2      .2       0
PD     0       1       1       1       1       1       0
PQ   300    1050    2200    3500    4800    6000    7600    9200   10800
12400
PT   913     914     915     916     917     918     919     920     921
922
PL     1       1       1       1       1       1       1       1       1
1
C THE PP VALUES ARE REDUCED BY 5000 TO ACCOUNT FOR LEAKAGE LOSSES  IE THE
C SERVICE UNIT IS NOT OPERATING
PP 74000   76000   78000   88000  100000  100000  100000
PS    80     103     110     120     130     140     180
PE   .79     .79     .79     .80     .80     .80     .80     .80     .80
.80
PE   .80     .80     .80     .80     .80     .80     .81     .81     .81
.81
PE   .82     .82     .82     .82     .83     .83     .83     .83     .83
.84
PE   .84     .84    .845    .845    .845    .845    .845    .845    .845
.845
PE  .845    .845    .845    .845    .845    .845    .845    .845    .845
.845
CP   225   10000
IDBUFORD DAM    2334430
RT   225     222
C GFM:
DR   225                                               1          1.5473
QD    12  107.72  108.00  109.12  112.85  121.94  142.46  150.87  141.60
134.80
```

```
QD129.08  113.17  112.26
CS     9       1      32      60      90     121     181     273     335
365
C          01JAN   01FEB   01MAR   31MAR   01MAY   30JUN   30SEP   01DEC
31DEC
C **************** CHATTAHOOCHEE RIVER NEAR NORCROSS, GA * RIVER MILE 438.54
CP   222   11000
ID NORCROSS     2335000
RT   222     221
C GFM:
DR   222                                               1
C QD    12   10.42    9.77   10.37   11.81   13.22   14.83   13.61   14.12
13.30
C QD 13.02   10.42    9.61
QD    12       0       0       0       0       0       0       0       0
0
QD     0       0       0
C **************** MORGAN FALLS ************************ RIVER MILE 420.39
C CODED JUNE 9, 1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
RL   221    2250     290    2000    2250   11111   13430
RO     1     220
RS     5     290     755    2250    2265   13430
RQ     5      -1      -1      -1      -1      -1
RA     5      80     250     540     550     640
RE     5     858     861     866   866.1     868
P1   221   16000     1.0       1     811       0    0.68
P2          5440
PR     0       0       0       0       0       0       0       0       0
0
PR     0       0
PQ   500    1000    2000    3000    4000    5000    6000    7000
PT 810.3     811     812   812.8   813.6   814.3   814.9   815.5
PP     0   12500   13800   16000   16000
PS     0     290     755    2250    3430
CP   221  100000
ID MORGAN FALLS2335500
RT   221     220
C GFM:
DR   221                                               1
C QD    12   78.55   62.78   79.08   96.21  112.24  144.40  145.87  141.10
133.35
C QD125.83  119.97  111.21
QD    12       0       0       0       0       0       0       0       0
0
QD     0       0       0
C **************** CHATTAHOOCHEE RV AT ATLANTA ********* RIVER MILE 410.74
CP   220   17000     750     750
ID ATLANTA      2336000
RT   220     217
C GFM:
DR   220                                               1          1.5473
QD    12  231.96  226.07  225.34  237.51  256.68  277.96  288.11  277.96
268.36
QD255.76  237.27  229.01
C **************** CHATTAHOOCHEE RV AT WHITESBURG ****** RIVER MILE 367.62
CP   217  999999
IDWHITESBURG
RT   217     215
```

```
C GFM:
DR   217                                                1          1.5473
QD    12 -165.12 -160.42 -159.05 -167.77 -180.37 -194.23 -204.41 -199.22 -
192.33
QD-181.7 -168.22 -162.91
C *************** WEST POINT DAM ********************* RIVER MILE 309.17
C CODED JUNE 10, 1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
RL   215  462295
RL     1     215      -1          298396
RL     2     215      -1          347605
C                                  623
C STORAGE FOR LEVEL 3 WERE INCREASED BY 20000 TO SIMULATE OBSERVED OPERATIONS
RL     3     215      31          462295  462295  462295  550475  574387
624527
C  ELEVATION                      628.95  628.95  628.95  632.82  633.81
635.7
C  DATE                           01JAN   15FEB    28FEB  15APR   01MAY   01JUN

RL                                624527  624527  624527  624527  624527
624527
C
C  DATE                           17JUN    18JUN   30JUN   01JUL   17JUL  18JUL

RL                                624527  624527  624527  624527  624527
624527
C
C  DATE                           30JUL     31JUL  18AUG    19AUG   30AUG
31AUG

RL                                624527  624527  624527  624527  624527
624527
C
C  DATE                           17SEP     18SEP  30SEP    01OCT  18OCT  19OCT

RL                                624527  624527  610000  609100  508969
485630
C  ELEVATION                                      635.21  635.17  631.07
630.03
C  DATE                           31OCT     01NOV   16NOV    17NOV  01DEC
02DEC

RL                                462295
C  ELEVATION                      628.95
C  DATE                           31DEC

RL     4     215      -1          744254
C RL   5     215      -1          744264
RL     5     215      -1          906182
RO     1     214
RS    26  298389  314196  330596  347605  365239  383507  402429  422016
442016
RS463251  484927  507330  530475  554376  579050  604516  630783  657874
685801
RS714585  744239  774782  806229  838601  871912  906182
RQ    26  122000  132000  142000  152000  162000  172000  187500  203000
210000
RQ218000  225000  234000  243000  253000  263000  273340  279000  285250
290000
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RQ295000  301000  307000  310000  313000  316000  320000
RA    26   15512   16100   16702   17318   17949   18593   19252   19926
20615
RA 21318   22037   22771   23520   24286   25067   25864   26677   27507
28353
RA 29216   30096   30993   31907   32838   33788   34755
RE    26     620     621     622     623     624     625     626     627
628
RE   629     630     631     632     633     634     635     636     637
638
RE   639     640     641     642     643     644     645
P1   215   81700     1.0       0   565.5       0   0.787       1
C  ACTUAL CAPACITY IS CONSIDERED TO BE 85000 KW BUT 3300KW WILL BE ASSIGNED
C  TO THE 650 CFS LEAKAGE. THIS LEAKAGE IS REALLY THE SERVICE UNIT DISCHARGE
C  79.2 MWH (3,300 X 24) WILL BE ADDEED TO EACH DAY'S ENERGY PRODUCTION OUTSIDE
THE MODEL.
P2   650   18100       0

PC     6       0    .005     .35    .732    .829     1.0
PF     6    .083    .083    .083    .083    .083    .125
PR     1       1       1       1       1       1       1       1       1
1
PR     1       1

C PD   0      .2      .2      .2      .2      .2       0
PD     0       1       1       1       1       1       0
PQ     0     800    2300    4000   12000   21700   35500   54200   80000
123500
PT   557     558     559     560     564     568     572     576     580
585
CP   215   30000
IDWEST POINT    2338500
RT   215     214
DR   215                                               1
QD    12   33.22   33.57   25.83   26.82   26.61   40.89   40.63   40.51
40.01
QD 37.37   28.77   20.58

CS    31       1      46      59     105     121     152     167     168
181
C           01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CS   182     198     199     212     213     229     230     243     244
259
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
CS   260     273     274     290     291     304     305     320     321
334
C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30NOV
CS   335     365
C   01DEC   31DEC

CG -4.06     620     620     620     620     620     620     620     620
620
C           01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CG   620     620     620     620     620     620     620     620     620
620
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
CG   620     620     620     620     620     620     620     620     620
620
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C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30NOV
CG   620     620
C   01DEC   31DEC


CG -1.06     623     623     623     623     623     623     623     623
623
C           01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CG   623     623     623     623     623     623     623     623     623
623
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
CG   623     623     623     623     623     623     623     623     623
623
C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30NOV
CG   623     623
C   01DEC   31DEC
CG -1.53  635.99  635.99  635.99  635.99  635.99  635.99  635.99     626
626
C           01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CG635.99  635.99     626     626  635.99  635.99     626     626  635.99
635.99
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
CG   626     626  635.99  635.99     626     626  635.99  635.99     626
626
C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30N0V
CG635.99  635.99
C   01DEC   31DEC
CG -1.06     636     636     636     636     636     636     636     636
636
CG   636     636     636     636     636     636     636     636     636
636
CG   636     636     636     636     636     636     636     636     636
636
CG   636     636
QM  -215     650     650    5350     650


CP   214  100000     650     650
IDWEST PT GAGE  2339500
RT   214     211

C **************** BARTLETS FERRY DAM ****************** RIVER MILE 285.72
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RL 211  182500  120500  161500  182500  182500  182500
RL   211  182500  120500  161500  182500  193500  324000
C    2,500 AC FT ADDED TO LEVEL 4 FOR IMPROVED OPERATIONS
C    FOR 205 DURING SPILLS PER HEC INSTRUCTIONS
RO     1     205
RS     6   86000  120500  176000  193500  242500  324000
C RQ   6   21300   21300   21300   35000  300000  350000
RQ     6      -1      -1      -1      -1      -1      -1
RA     6    3450    4500    5700    5900    7400    9600
```

```
RE     6     500     510     520     521     530     540
P1   211  173000    1.11             406            .875
P2         22500
PR     0       0       0       0       0       0       0       0       0
PR     0       0
CP   211  100000       0       0
ID BARTLETTS FY
RT   211     210
C *************** GOAT ROCK DAM ********************** RIVER MILE 280.02
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RL-210    8750    8750    8750    8750    8750    8750
RL  -210    8750    8750    8750    8750    8750   21500
RO
RS     6    3800    5250    8750   10700   12900   21500
RQ     6      -1      -1      -1      -1      -1      -1
RA     6     825     870     970    1020    1070    1265
RE     6     398     400     404     406     408     415
P1   210   26300     1.0       0     338            0.76
P2          6264
PR     0       0       0       0       0       0       0       0       0
0
PR     0       0
CP   210  100000       0       0
ID GOAT ROCK
RT   210     209
C *************** OLIVER DAM ************************ RIVER MILE 271.40
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RL-209   32000   32000   32000   32000   32000   32000
RL  -209   32000   32000   32000   32000   32000   34000
RO
RS     4   19000   25500   32000   34000
RQ     4      -1      -1      -1      -1
RA     4    1500    2000    2350    2400
RE     4     330     334     337     338
P1   209   60000     1.0             271            0.83
P2         12925
PR     0       0       0       0       0       0       0       0       0
0
PR     0       0
CP   209  100000       0       0
ID OLIVER DAM
RT   209     208
C *************** NORTH HIGHLANDS DAM **************** RIVER MILE 270.33
C CODED JUNE 16,1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RL-208    1550    1550    1550    1550    1550    1550
RL  -208    1550    1550    1550    1550    1550    3250
RO
RS     6     560    1000    1480    1630    2480    3250
RQ     6      -1      -1      -1      -1      -1      -1
RA     6      62     102     135     140     173     202
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RE     6     260     265     269     270     275     280
P1   208   29600     1.3             232            .887
P2         13140
PR     0       0       0       0       0       0       0       0       0
0
PR     0       0
CP   208  100000       0       0
ID N. HIGHLANDS
RT   208     205
C *************** CHATTAHOOCHE RIVER AT COLUMBUS,GA **** RIVER MILE 267.67
CP   205  100000    1160    1160
ID COLUMBUS GAGE 02341500
RT   205     200
DR   205                                             1
QD    12  -17.90  -17.34   -0.43   19.83   24.81   55.70   47.44   48.04
48.69
QD 30.88   21.50   17.17
C **************** WALTER F. GEORGE DAM **************** RIVER MILE 182.94
C CODED JUNE 30, 1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : BUFFER
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL (TOP OF ZONE 1)
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RESERVOIR LEVELS 184,184.5-187,185.5-188, 187.5-189, 188-190, 190, 194
RL   200  847100
RL     1     200      -1          690000
RL     2     200      -1          746350

RL     3     200      31          847100  847100  847100  847100  934400
934400
C     DATE                         JAN 1   FEB 15  FEB 28 APR 15  MAY 1   JUN 1
C     ELEVATION                    188     188     188      188    190     190

RL                                934400  934400  934400  934400  934400
934400
C     DATE                        JUN 17  JUN 18  JUN 30  JULY 1  JULY 18
JULY19
C     ELEVATION                   190      190     190     190     190     190

RL                                934400  934400  934400  934400  934400
934400
C     DATE                        JUL 30  JUL 31  AUG 18  AUG 19  AUG 30  AUG
31
C     ELEVATION                    190     190     190     190     190     190

RL                                934400  934400  934400  933200  912200
911000
C     DATE                        SEP 17  SEP 18  SEP 30  OCT 1   OCT 18  OCT
19
C     ELEVATION                    190     190     190     190    189.5
189.5

RL                                890000  889000  860000  859000  848000
847100
C     DATE                        OCT31   NOV 1   NOV 18  NOV 19  NOV 30  DEC 1
C     ELEVATION                   189     189     188.3   188.3   188     188

RL                                847100
C                                 DEC 31
C                                 188

RL     4     200      -1          934410
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C RL   5     200      -1         1129000
RL     5     200      -1         1475800
RO
RS   -35    2.61   11.68   18.67   27.24   37.92   51.21   67.83   89.10
118.1
RS 161.5   196.7   224.0   308.7   419.0   556.3   587.6   620.2   654.4
690.0
RS 727.1   765.6   805.5   847.1   890.0   934.4   980.5  1028.1  1077.6
1129.0
RS1182.1  1237.1  1294.0  1352.7  1413.3  1475.8
RQ    35       0       0       0       0       0       0       0       0
0
RQ     0       0       0       0       0       0       0       0   10000
31200
RQ 31200   31200   31200   50000   53000   57900  150000  153000  156000
160000
RQ397000  417000  438000  448000  470000  500000
RA    35     587    1248    1550    1894    2375    2966    3720    4895
6815
RA 10624   12815   14501   19457   24556   30557   31897   33396   34880
36375
RA 37784   39210   40735   42210   43665   45181   46850   48615   50356
52250
RA 54045   55975   57800   59650   61528   63375
RE    35     110     120     125     130     135     140     145     150
155
RE   160     163     165     170     175     180     181     182     183
184
RE   185     186     187     188     189     190     191     192     193
194
RE   195     196     197     198     199     200
P1   200  154000     1.0             112            .832       1
P2         31200       0
PC     6       0    .005     .35    .732    .829     1.0
PF     6    .083    .083    .083    .083    .083    .125

PR     1       1       1       1       1       1     1.2     1.2     1.2
1.2
PR     1       1

C PD   0      .2      .2      .2      .2      .2       0
PD     0       1       1       1       1       1       0
PQ     0    4000   10400   16800   25200   34900   46200   59100   73000
87000
PT 101.9     102     106     110     115     120     125     130     135
140
CP   200   35000
ID W.F.GEORGE
RT   200     199
DR   200                                               1
QD    12    3.67    3.55   -4.87   -0.31   14.93    3.31    5.51   -0.78   -
5.40
QD  0.15   -4.53   -4.42

CS    31       1      46      59     105     121     152     167     168
181
C          01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CS   182     198     199     212     213     229     230     243     244
259
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
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CS   260     273     274     290     291     304     305     320     321
334
C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30NOV
CS   335     365
C   01DEC   31DEC

CG -4.01     180     180     180     180     180     180     180     180
180
CG   180     180     180     180     180     180     180     180     180
180
CG   180     180     180     180     180     180     180     180     180
180
CG   180     180

CG -1.01     184     184     184     184     184     184     184     184
184
CG   184     184     184     184     184     184     184     184     184
184
CG   184     184     184     184     184     184     184     184     184
184
CG   184     184

CG -1.80  189.99  189.99  189.99  189.99  189.99  189.99  189.99     187
187
C              1      46      59     105     121     152     167     168
181
C           01JAN    15FEB   28FEB  15APR   01MAY    01JUN  16JUN   17JUN
30JUN
CG189.99  189.99     186     186  189.99  189.99     186     186  189.99
189.99
C    182     198     199     212     213     229     230     243     244
259
C    01JUL  17JUL  18JUL   31JUL   01AUG    17AUG   18AUG   31AUG   01SEP
16SEP
CG   186     186  189.99  189.99     186     186  189.99  189.99     186
186
C    260     273     274     290     291     304     305     320     321
334
C   17SEP  30SEP  01OCT     17OCT   18OCT   31OCT   01NOV   16NOV   17NOV
30NOV
CG189.99  189.99
C    335     365
C   01DEC   31DEC

CG -1.10     190     190     190     190     190     190     190     190
190
CG   190     190     190     190     190     190     190     190     190
190
CG   190     190     190     190     190     190     190     190     190
190
CG   190     190
QM  -200      10      10    8000    1000

C    *********CONTROL POINT AT ANDREWS****************** RIVER MILE 154.3
CP   199  100000
IDGEORGE ANDREWS
RT   199     196
DR   199                                                  1
QD    12  -11.35   -9.84   -8.93   -3.05   11.24   31.04   20.19   -0.24   -
6.60
QD -6.79   -6.29   -6.51
C **************** DUMMY RESERVOIR AT GRIFFIN GAGE SITE * RIVER MILE 412.15
```

```
RL   360
RO
RS     2       1     100
RQ     2      -1      -1
RE     2       1      10
CP   360  999999
ID GRIFFIN
C 02344500 FLINT RIVER NEAR GRIFFIN, GA
RT   360     350
DR   360                                               1
QD    12   10.29   10.51    8.43   13.31   16.66   16.90   16.15   16.43
15.03
QD 12.31   12.93    9.81
C  ************** FLINT RV AT MONTEZUMA, GA ************ RIVER MILE 288.42
CP   350  999999
ID MONTEZUMA
RT   350     340
DR   350                                               1
QD    12   15.25   15.76   15.92   19.93   24.87   32.03   28.99   27.62
26.07
QD 21.78   21.74   18.31
C  ************** FLINT RV AT ALBANY DAM SITE ********** RIVER MILE 211.9
CP   340  999999
ID ALBANY
RT   340     330
DR   340                                               1
QD    12  -20.03  -19.55  -15.05   -2.14  106.56  347.59  192.23   75.78
29.64
QD  2.90    1.76   -9.13
C  ************** FLINT RV AT NEWTON, GA *************** RIVER MILE 177.27
CP   330  999999
ID NEWTON
RT   330     320     1.2       0      24
DR   330                                               1
QD    12  -30.21  -27.70  -30.49  -18.90   73.76  252.89  125.92   26.47  -
10.81
QD-25.05  -24.95  -27.81
C  ************** FLINT RIVER AT BAINBRIDGE ************* RIVER MILE 136.81
CP   320  999999
ID  BAINBRIDGE
RT   320     196
DR   320                                               1
QD    12   -6.06   -3.80   -2.82   -2.50   -3.64   -3.89   -4.59   -3.83   -
3.61
QD -3.39   -3.44   -2.20
C *************** JIM WOODRUFF DAM ******************** RIVER MILE 107.58
C CODED JUNE 30, 1993
C RESERVOIR LEVEL  1 : DEAD STORAGE
C RESERVOIR LEVEL  2 : TOP OF BUFFER POOL
C RESERVOIR LEVEL  3 : TOP OF CONSEVATION POOL
C RESERVOIR LEVEL  4 : TOP OF FLOOD CONTROL POOL
C RESERVOIR LEVEL  5 : TOP OF DAM
C RL 196  398385  297628  335130  398385  447720  447728
RL   196  398385  297628  335130  398385  407720  509990
C  ELEV.    77.8    75      76.4     77.8    79      79
C  ELEVATIONS ARE FOR STORAGES ON RL RECORDS
RO     2     296     192
RS    24       0     682    1967   35368   42881   51453   61159   72077
84280
RS 97848  112858  129379  147492  167279  188893  212560  238444  266742
297628
RS331146  367311  406154  447728  509990
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RQ    24    1000    1000    1000    1000    1000    1000    1000    2000
4000
RQ  4500    4500    6500    8500    8500    8500    8500    8500    8500
8600
RQ 30000  204000  214000  230000  340000
RA    24       0     433     880    7009    8030    9127   10300   11549
12874
RA 14275   15752   17305   18937   20650   22620   24750   27060   29580
32200
RA 34840   37500   40200   42980   46000
RE    24      44      48      50      60      61      62      63      64
65
RE    66      67      68      69      70      71      72      73      74
75
RE    76      77      78      79      80
P1   196   36000     1.0              42            .789       1
P2   100   18300       0
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300
PR   300     300      24
PD 0.142    .143    .143    .143    .143    .143   0.143
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172000
PT    39      42      43      48      52      56      60      64      70
73
CP   196  400000    5000    5000
ID JIM WOODRUFF
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DR   196                                              1
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173.18
QD155.78  132.28  163.87
CP   296  400000    1000
IDONEFOOT
RT   296     194


CS    31       1      46      59     105     121     152     169     170
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30JUN
CS   182     200     201     212     213     231     232     243     244
261
C    01JUL  19JUL  20JUL   31JUL   01AUG    19AUG   20AUG   31AUG   01SEP
18SEP
CS   262     273     274     292     293     304     305     322     323
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C   19SEP  30SEP  01OCT     19OCT   20OCT   31OCT   01NOV   18NOV   19NOV
30NOV
CS   335     365
C   01DEC   31DEC

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CG    65      65      65      65      65      65      65      65      65
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CG    65      65      65      65      65      65      65      65      65
65
CG    65      65

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76.49
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76.49
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76.49
CG 76.49   76.49

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76.5
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30JUN
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77.89
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18SEP
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30NOV
CG 77.89   77.89
C   01DEC   31DEC

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77.9
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77.9
CG  77.9    77.9    77.9    77.9    77.9    77.9    77.9    77.9    77.9
77.9
CG  77.9    77.9
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C  *************** APALACHICOLA RV AT CHATTAHOOCHEE, FL * RIVER MILE 107
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IDCHATTAHOOCHEE
RT   194     192
DR   194                                                1
QD    12   -0.48   -0.51   -0.48   -0.47   -0.47   -0.43   -0.51   -0.48  -0.47
QD -0.51   -0.47   -0.50
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C CP   192  999999    7500    5000
CP   192  999999    5000    5000
IDBLOUNTSTOWN
RT   192     185
DR   192                                                1
QD    12   -1.09   -0.87   -0.48    0.05    4.39    4.29    3.80    3.71
4.02
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C  *************** APALACHICOLA RV NR SUMATRA, FL ****** RIVER MILE 20.3
CP   185  999999
ID SUMATRA
RT   185
DR   185                                                1
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67.71
QD 63.63   37.00   50.99

ED
BF     2     365     365       039010100       0      24
ZR=IN225      A=CHATTAHOOCHEE B=BUFORD C=FLOW_INC F=UNIMP_CMA7
```

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A. Michael Sheer, HydroLogics, Inc

From:
Megan Rivera, HydroLogics, Inc

Date:
May 29, 2008

Subject:
Ramping Account Balancing

Although the stated purpose of the IOP is to mimic nature to the extent possible in a managed system, the ramp-down restrictions are highly artificial. Ramp-down restrictions require the Corps to release vast amounts of water from storage to "smooth out" the natural variations in stream flow that occur when it rains. Instead of storing the storm pulse, as it could and should, the Corps is instead required to let it go—because it is required to release 100% of Basin Inflow at the critical times—and the Corps is *also* required to release substantial water from storage to provide a gradual ramp-down from the higher levels associated with the run-off. If there is any scientific basis for this requirement it is not identified in the Biological Opinion or in the administrative record for the IOP.

We assessed the impact of ramping rate releases in two ways. First, we ran a model of the MIOP with and without ramping requirements. In most years, the storage deficit caused by ramping releases is cleared in the spring when the reservoirs refill. The impact on system storage within a single year or during an extended drought, however, can be substantial. In 2006, for example, the system storage was depleted by 80,000 af by the ramping restrictions.

There are provisions in the IOP to reclaim some of this water to storage through a volumetric balancing scheme. Note that the MIOP model does not include any attempts to recover ramping releases. This is consistent with HEC-5 IOP models released by the Corps. Preliminary work with the Concept 5 version of the IOP showed that 1) a number of assumptions need to be made in order to model account balancing, and there was insufficient information available to reflect how the accounts would be balanced in practice, and 2) very little water could actually be recovered over a wide range of assumptions. For this reason, analysis of ramping rate account balancing was done using historical releases rather than model runs.

From the period January 7, 2007 to October 1, 2007, the amount of water required to meet ramping restrictions was determined based on the USGS reported Chattahoochee gage flow. Specifically, the minimum required flow based on the version of the IOP in effect and the ramping restrictions applied to the previous day's release was calculated. The amount of water released for ramping requirements was then calculated as the smaller of this minimum flow or the actual release, minus the minimum required flow without ramping restrictions. This ramping requirement release was then capped by the decrease in storage for the day. The amount of water recovered through under-releases was also calculated as the required release minus the USGS reported Chattahoochee gage flow (positive values only).

Table 1 shows the amount of water released for ramping restrictions and the amount recovered through under-releases from January 7, 2007 to October 1, 2007. Severe restrictions were placed on when and how under-releases could be made in May of 2007, so data is shown before and after May 1. Between May and October of 2007, only 3000 af of water was recovered through under-releases. Note that the restrictions were imposed after the Corps recovered about 110,000 af of its ramping releases in the Spring of 2007: the system would be up to 110,000 af lower now had these restrictions been in place then.

Table 1: Ramping Release Account Balances in 2007

	Releases made for ramping (af)	Under-releases (af)
1/7/2007 to 5/1/2007	160,000	110,000
5/1/2007 to 10/1/2007	20,000	3000

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Date:
May 29, 2008

Subject:
Lanier Stage When Drought Contingency Operations End

This document details the technique used to determine the probable stage in Lake Lanier when the Drought Contingency Operations end. First, the "Hirsch" forecasting technique[1] was used to generate 67 potential inflow traces for the period May 1, 2008 to April 30, 2009. Each trace was based on the hydrology from one year between1940 and 2007. The historical inflows were adjusted based on antecedent inflows to account for current basin conditions.[1]

Each of these 67 traces was then run through the MIOP model for the period May 1, 2008 to April 30, 2009. Table 1 shows the month in which Drought Contingency Operations end for each of the traces as well as the zone of Lake Lanier's stage on the day that the DCO ends. Note that in 15 of the years, the DCO remains in effect beyond April 30, 2009; these years are given a "0" in the Lanier Zone column.

[1] Add references—Lewis, let me know if you aren't referencing the forecast papers elsewhere (those same references go here), and I'll find them. I know they're in the green book, for example.

Based on these results, Figure 1 shows the probability of Drought Contingency Operations ending this year under the MIOP. There is a 78% chance that the DCO will end within a year, with a 16% chance they will end by September 1, and a 57% chance they will end by the first of the year.

Table 2 shows the probability of Lanier being in Zone 1, 2, 3, or 4 when the DCO ends. As shown in Figure 1, there is a 22% chance that the DCO will be in effect beyond April 30, 2009. There is a 62% chance that the DCO will end before April 30 and that Lake Lanier will be in Zone 4. There is a 15% chance that the DCO will end before April 30 and that Lake Lanier will be in Zone 3. There were no traces in which the DCO ended before April 30 and Lake Lanier had recovered to Zone 2 or Zone 1.

Table 1: Month and Lanier Zone When DCO ends based on forecasted hydrology

Trace	Year	Month that DCO ends	Lanier Zone when DCO ends		Trace	Year	Month that DCO ends	Lanier Zone when DCO ends
1	1940	no end	0		35	1974	11/30/2008	4
2	1941	3/31/2009	4		36	1975	9/30/2008	4
3	1942	9/30/2008	4		37	1976	10/31/2008	4
4	1943	3/31/2009	4		38	1977	11/30/2008	4
5	1944	no end	0		39	1978	2/28/2009	4
6	1945	12/31/2008	4		40	1979	3/31/2009	4
7	1946	4/30/2009	3		41	1980	no end	0
8	1947	3/31/2009	4		42	1981	2/28/2009	3
9	1948	9/30/2008	4		43	1982	12/31/2008	4
10	1949	8/31/2008	4		44	1983	12/31/2008	4
11	1950	9/30/2008	4		45	1984	8/31/2008	4
12	1951	12/31/2008	3		46	1985	8/31/2008	4
13	1952	4/30/2009	4		47	1986	11/30/2008	4
14	1953	9/30/2008	4		48	1987	no end	0
15	1954	no end	0		49	1988	no end	0
16	1955	no end	0		50	1989	7/31/2008	4
17	1956	no end	0		51	1990	1/31/2009	3
18	1957	no end	0		52	1991	8/31/2008	4
19	1958	no end	0		53	1992	8/31/2008	4
20	1959	10/31/2008	4		54	1993	no end	0
21	1960	2/28/2009	4		55	1994	8/31/2008	4
22	1961	12/31/2008	3		56	1995	10/31/2008	4
23	1962	4/30/2009	3		57	1996	12/31/2008	4
24	1963	10/31/2008	4		58	1997	10/31/2008	4
25	1964	3/31/2009	4		59	1998	no end	0
26	1965	3/31/2009	4		60	1999	no end	0
27	1966	10/31/2008	4		61	2000	no end	0
28	1967	7/31/2008	4		62	2001	no end	0
29	1968	12/31/2008	3		63	2002	11/30/2008	3
30	1969	12/31/2008	3		64	2003	7/31/2008	4
31	1970	11/30/2008	4		65	2004	9/30/2008	4
32	1971	8/31/2008	4		66	2005	8/31/2008	4
33	1972	11/30/2008	3		67	2006	11/30/2008	4
34	1973	10/31/2008	4		68	2007	no end	0

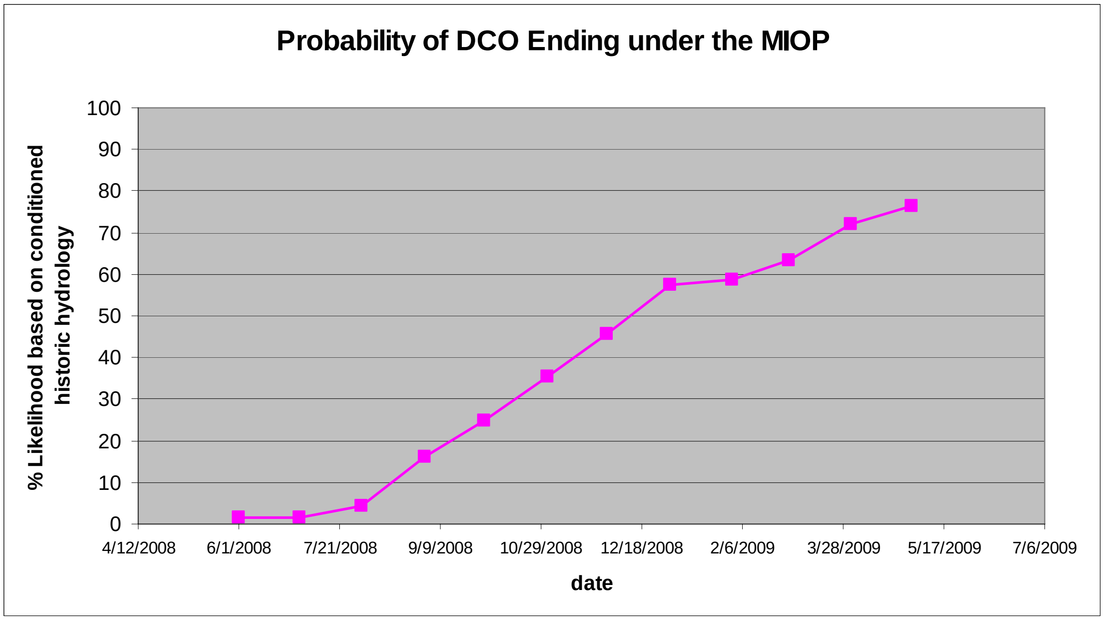

Figure 1: Probability of Drought Contingency Operations Ending this Year Under the MIOP.

Table 2: Probability of Lanier being in Zone 1, 2, 3, or 4 when the DCO ends.

Lanier Zone	# of years	probability
4	42	62
3	10	15
2	0	< 1.5
1	0	< 1.5
DCO continues	15	22

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Date:
May 28, 2008

ARCADIS Project No.:
GA0634770003

Subject:
Review and comments: USACE April 15, 2008 proposed ACF Modified Interim Operations Plan (MIOP)

---

1. Comments subsequently provided reflect my overall assessment of the Corps' proposed IOP modifications, from perspectives of efficacious (efficient, fair and risk-averse) and integrated river basin management. Since 1990 I have analyzed a great many ACF operational alternatives using the USACE HEC-5 model, including the 1989 Water Control Plan (WCP), water allocation formulas proposed by the States during the ACF Compact negotiations, and more recently the original and Concept 5 Interim Operations Plan (IOP), the Emergency Drought Operations (EDO) plan, and other species-protection operational proposals by stakeholders, e.g. the Maximum Sustainable Release Rule (MSRR). Currently in progress are forensic investigations of ACF models and data, and detailed analysis of the Concept 6 modified IOP (MIOP) using 2002 – 2007 hydrology. Nonetheless my assessment is guided primarily by career knowledge and experience in river basin planning and reservoir operations, as opposed to specific model results.

2. Comments are organized in the following categories:

   - Fundamental weaknesses of the IOP framework to ACF reservoir operations and river management.

   - Comparison of reservoir releases under the IOP and the WCP during droughts.

- Faulty assumptions, inaccurate or incomplete data input to the HEC-5 models applied by the Corps for analysis of the IOP, resulting in (1) inadequate accommodation of system physical limitations, hydrologic and operational uncertainties, (2) unrealistic assessment of system capacity for IOP compliance, and (3) under-estimation of IOP impacts and risks imposed on other uses of water and storage in the Basin, evidenced by the Corps' failure to anticipate the rapid drawdown of storage during severe drought conditions as were experienced during 2006 and 2007.

3. **Fundamental weaknesses of IOP and MIOP**

The MIOP essentially marries the IOP and the belated (i.e., only after annual system refill becomes virtually impossible) EDO response to emergency conditions inevitably resulting from the IOP. The MIOP eliminates the 6500-cfs intervening minimum release provision of the IOP and reduces the portion of Basin Inflow required to be released from 70% to 50%. However, the MIOP retains the unsustainable IOP requirement for full-spectrum regulation of BI by a reservoir system not designed for this purpose.

The IOP rules, summarized in Table 1, require the system to pass through 70% or more of Basin Inflow (BI) depending on time of year and composite conservation storage (sum of Lanier, West Point and W.F. George water in storage). In addition, minimum augmentation releases of 6500 and 5000 cfs are specified above and below zone 3, respectively.

Months	**Basin Inflow (BI) (cfs)**	**Woodruff minimum release (cfs)**
March – May	>=35,800	>=25,000 cfs
	18,000 – 35,800	Max{18,000, 70% BI}
	<18,000	Max{6,500, BI} (>=composite storage zone 3)
		Max{5,000, BI} (<composite storage zone 3)
June - February	>=23,000	>=16,000 cfs
	10,000 – 23,000	Max{10,000, 70% BI}
	<10,000	Max{6,500, BI} (>=composite storage zone 3)
		Max{5,000, BI} (<composite storage zone 3)

Table 1: USACE Concept 5 IOP operating rules

The MIOP rules, displayed in Table 2, reduce the BI pass-through requirement to 50%, eliminate the 6500-cfs flow augmentation requirement, incorporate winter refill and drought relief aspects of the EDO, and add an exceptional drought trigger zone below which minimum flow augmentation is reduced to 4500 cfs.

Months	Basin Inflow (BI) (cfs)	Woodruff minimum release (cfs)
March – May	>=34,000	>=25,000 cfs (>=composite storage zone 2)
	>=39,000	>=25,000 cfs (>=composite storage zone 3)
	16,000 – 34,000	Max{16,000, 50% BI} (>=composite storage zone 2)
	11,000 – 39,000	Max{11,000, 50% BI} (>=composite storage zone 3)
	5,000 – 16,000	BI (>=composite storage zone 2)
	5,000 – 11,000	BI (>=composite storage zone 3)
	<5,000	5,000 (<composite storage zone 3)
	Any	5,000 (<composite storage zone 4)
	Any	4,500 (<exceptional drought trigger zone)
June – November	>=24,000	>=16,000 (>=composite storage zone 3)
	8,000 – 24,000	Max{8,000, 50% BI} (>=composite storage zone 3)
	5,000 – 8,000	BI (>=composite storage zone 3)
	<5,000	5,000 (>=composite storage zone 3)
	Any	5,000 (<composite storage zone 4)
	Any	4,500 (<exceptional drought trigger zone)
December – February	Any	5,000 (>=exceptional drought trigger zone)
	Any	4,500 (<exceptional drought trigger zone)

Table 2: USACE Concept 6 IOP operating rules

It is apparent that the MIOP improves upon the IOP in terms of opportunity afforded for annual refill of system conservation storage. However, as has been demonstrated during 2006 and 2007, the IOP is unsustainable and creates unacceptable risks of system collapse, i.e. emptying of conservation storage, with attendant serious economic and environmental consequences. As subsequently shown, the MIOP does not remedy the fundamental deficiencies of the IOP nor relax its provisions sufficiently to reduce these risks to levels approaching the WCP, and as a consequences forecloses opportunities for future operational adaptations to demands of growing populations on water and storage.

A major weakness of the IOP/MIOP framework is evident in Figures 1 and 2, graphically depicting IOP BI release requirements in conflict with WCP rule curves and zones designed to induce seasonal conservation storage drawdown and refill during dry years (2000 in this example).

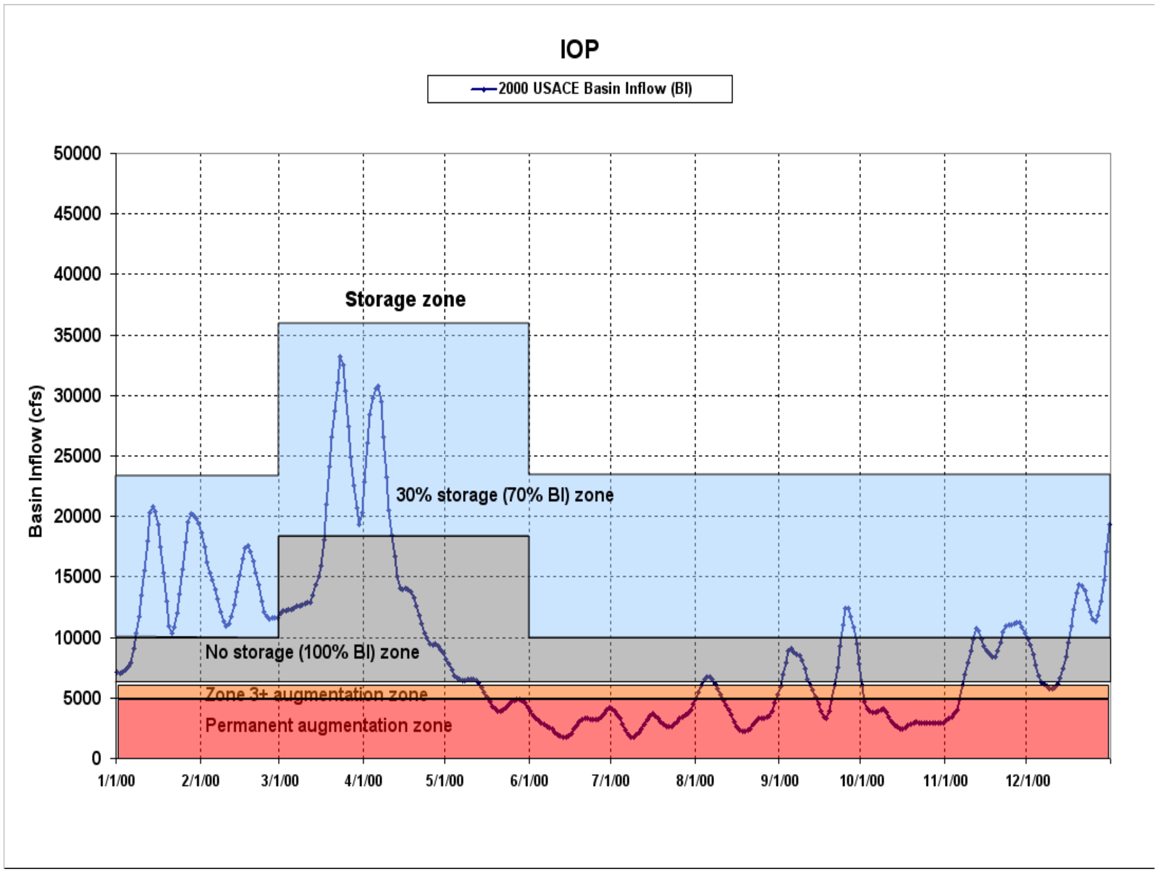


Figure 1: IOP Woodruff release requirements and dry-year (2000) Basin Inflow

The MIOP partially relieves some of the more onerous provisions of the IOP, though as subsequently described this relief does not fully mitigate the wasteful use of system storage inherent to the basic IOP framework in comparison to the WCP. Subsequent comments on the fundamental weaknesses of the IOP thus also apply to the MIOP. Figure 1, for example, shows that the IOP allows no water to be stored in the system when BI is less than 10,000 cfs at any time during the year, and none when BI is less than 18,000 cfs during March, April and May – precisely coinciding with the prescribed refill of seasonal conservation pools shown in Figure 2. Woodruff is a pondage reservoir with insignificant storage relative to BI, further limited by stability constraints on net allowable differential head on the dam (headwater minus tailwater elevation). Only 30% of system inflow may be stored for most of the year when BI ranges between 10,000 and 23,000 cfs, and between 18,000 and 35,800 cfs from March through May. Statistical period-of-record (1939 – 2007) analysis reveals that the IOP only allows significant capture of above-normal system inflows. In actuality, the poor distribution of system storage relative to BI makes inflow capture and storage refill considerably less likely under the IOP than the WCP.

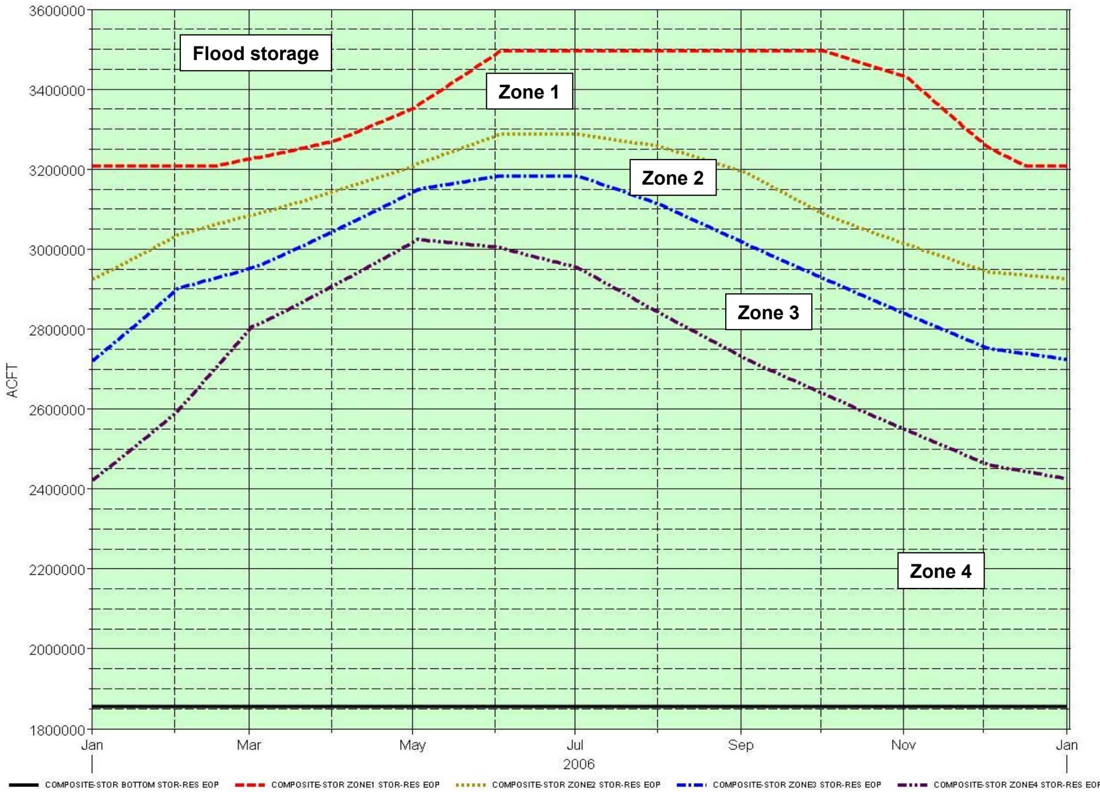


Figure 2: IOP seasonal composite storage zones

Refill of the conservation pools prior to June 1 is critical to maximize water in storage in advance of the dry summer months, when reservoir inflows are lowest relative to all economic and environmental demands. Lower starting pools at the beginning of summer, especially in the case of Lanier, leads to lower pools at the end of the year and reduced chances of refill in the next year. The combined problems of summer-fall drawdown and winter-spring refill are greatly exacerbated under the IOP by (1) high spring spawning release requirements coincident with rising WCP-mandated seasonal conservation pools, (2) extremely poor distribution of system storage relative to Basin Inflows, and (3) limitations on the system's capacity to store and release water precisely as required by the IOP while continuing to meet at-site purposes, e.g. hydropower and instream flows for municipal and industrial water supply, cooling water for thermal powerplants, and water quality.

The following stepwise analysis discloses that the overall risks to the system posed by the IOP during multi-year regional droughts (as frequently experienced in the southeast) are much greater than suggested by Figure 1. The IOP/MIOP operational framework relies on balanced use of conservation storage in Lanier, West Point and W.F. George, so that ideally all reservoirs are in the same zone (1 – 4) simultaneously. The zones, delineated in the 1989 WCP, were intended to roughly equalize chances of refilling each storage reservoir when operating under the WCP, and as subsequently shown are poorly-suited to the IOP. Moreover, the ACF storage reservoirs were developed incrementally and were not planned or designed to operate as an integrated system. In the first place, balanced-pool operation is a practical impossibility due to the disparity between project inflows and conservation storage, i.e. Lanier rises and falls much more slowly than West Point, which in turn responds more slowly to inflows than W.F. George. The reason for this is the ratio of project inflow to allocated conservation storage, shown in Figure 3, which is inversely proportional to the time required to drain and fill reservoirs. Thus West Point can drain and fill nearly 10 times as quickly as Lanier assuming average inflow to both reservoirs. By the same token W.F. George can respond more than twice as quickly as West Point. As a consequence, the risks posed by draining, for example, 50% of Lanier's conservation storage are orders of magnitude greater than the equivalent portion of W.F. George's conservation pool. Thus a better measure of balanced system operation than remaining storage is the chance of refill within a fixed period of time.

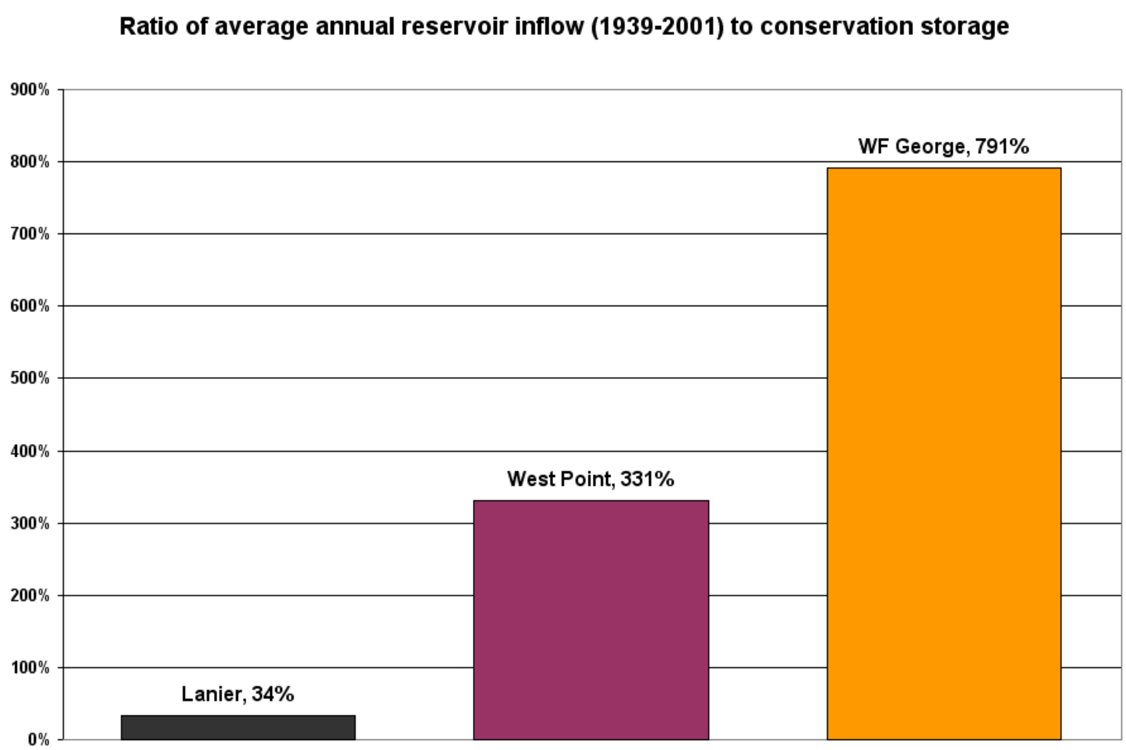


Figure 3: Inflow to conservation storage ratios

Under the IOP, water from all three reservoir conservation pools must be routed downstream in a timely manner to Jim Woodruff Dam, to enable required releases. Consequently when flow augmentation is required (i.e. BI less than required Woodruff release), Lanier, West Point and W.F. George releases are apportioned to maintain each reservoir insofar as possible in the same (WCP) zone. Consequently Lanier tends to be drawn down at the same rate as West Point and W.F. George under the IOP, but as previously shown cannot refill nearly as quickly as the lower reservoirs. Figure 4 applies the inflow-to-conservation storage analysis of Figure 1 to assess the effects of disproportionate size and placement of conservation storage in the ACF Basin to BI capture efficiency and related capacity for regulation of Basin outflow.

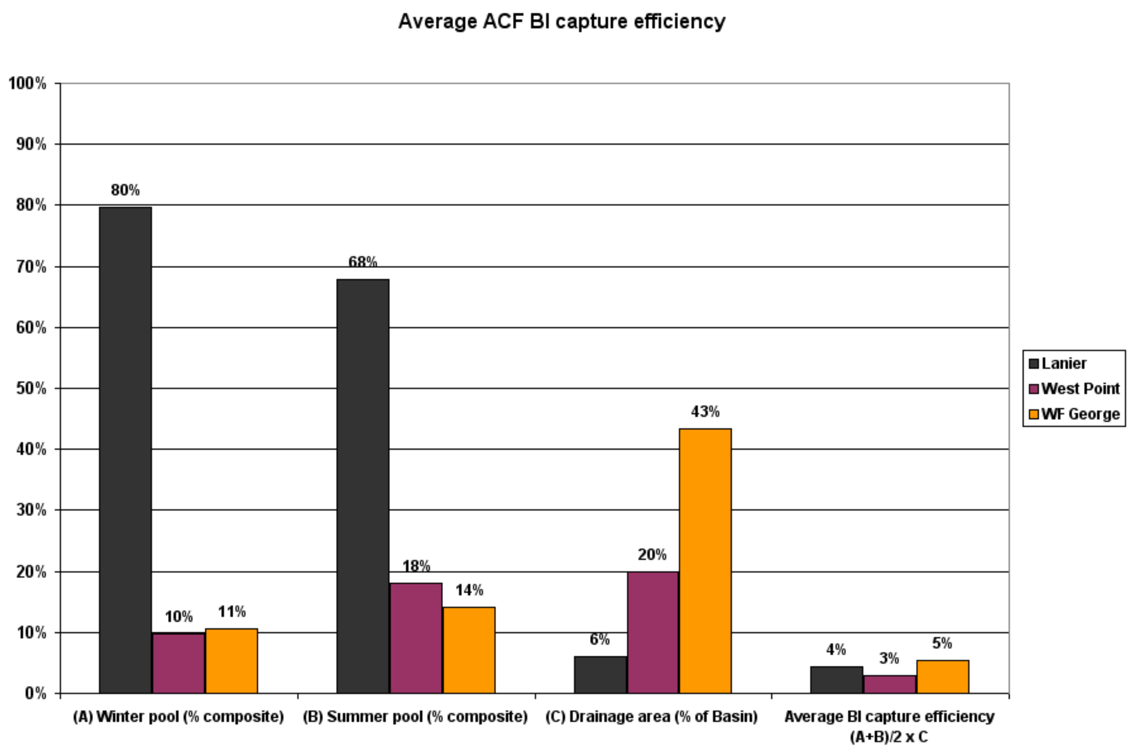
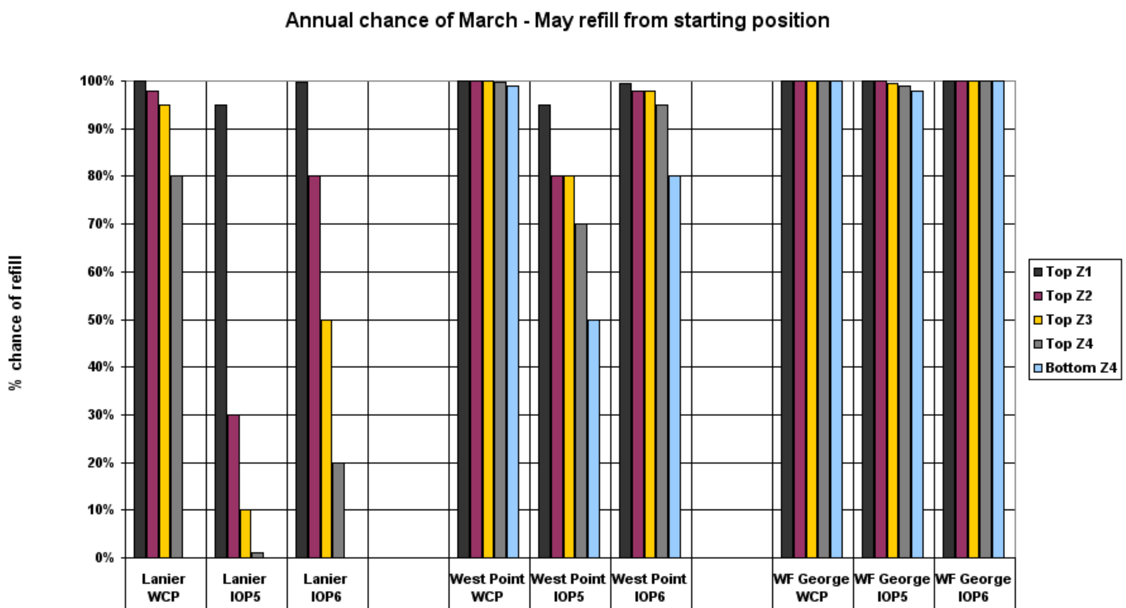


Figure 4: ACF conservation storage distribution and BI capture efficiency

The IOP and the MIOP to a lesser degree conflict with the need to refill system conservation storage during periods of low inflow, when releases are required from storage to augment Basin Inflows up to 6,500 cfs. Even when Basin Inflows fall in the normal range, constraints on refill are significant during the March – May spawning season, when the IOP only allows 30% of inflow to be stored while the reservoir rule curves rise to full summer pool levels. The mismatch between WCP rule and guide curves and the IOP spawning release requirements is evident in Figure 5, showing a drastic reduction in chance of refill under the IOP to full summer pool levels from March

– May of each year, based on starting position (e.g. top of conservation pool, top of zone 1, etc. to bottom of conservation pool) and BI capture efficiency. It should be noted that Figure 5 accounts only for the IOP rules for Woodruff releases; rule curve refill is further constrained in actuality by reservoir releases to meet at-site requirements including hydropower, water supply and minimum instream flows for water quality and other purposes. Figure 6 alternatively displays these results, showing the exacerbation of natural imbalance in system storage due to reduced opportunities for BI capture under the IOP, with the most severe impacts felt at Lanier and diminishing moving downstream. The analysis indicates that, while the MIOP is an improvement over the IOP, it is not nearly sufficient to reduce risks to pre-IOP levels nor to restore opportunities for operational adaptation to changing demands on water and storage in the Basin.



	Lanier WCP	Lanier IOP5	Lanier IOP6		West Point WCP	West Point IOP5	West Point IOP6		WF George WCP	WF George IOP5	WF George IOP6
Top Z1	100.00%	95.00%	99.80%		100.00%	95.00%	99.50%		100.00%	100.00%	100.00%
Top Z2	98.00%	30.00%	80.00%		100.00%	80.00%	98.00%		100.00%	100.00%	100.00%
Top Z3	95.00%	10.00%	50.00%		100.00%	80.00%	98.00%		100.00%	99.50%	100.00%
Top Z4	80.00%	1.00%	20.00%		99.80%	70.00%	95.00%		100.00%	99.00%	100.00%
Bottom Z4	0.00%	0.00%	0.00%		99.00%	50.00%	80.00%		100.00%	98.00%	100.00%

Figure 5: ACF annual March–May chance of refill under WCP, IOP (IOP5) and MIOP (IOP6)

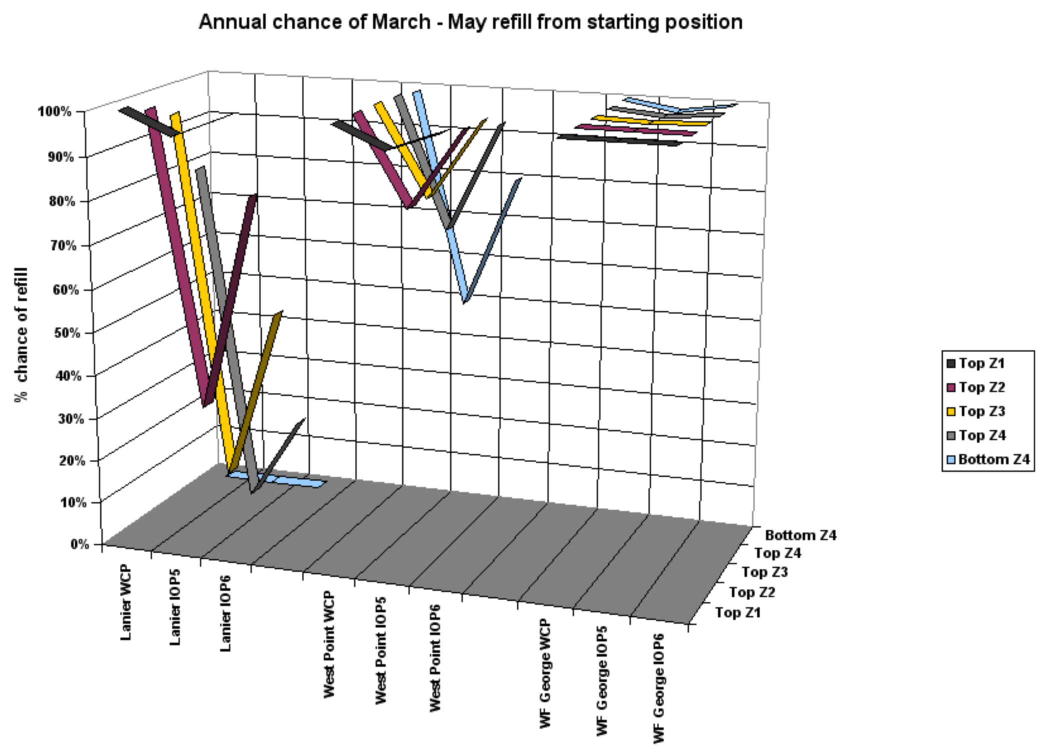


Figure 6: WCP, IOP (IOP5) and MIOP (IOP6) impacts on probability of refill

Other aspects common to the IOP and the MIOP that routinely necessitate releases from system storage in excess of the requirements of the basic rules are as follows:

- Ramp-down rate limits – maximum allowable rate of reduction of Woodruff releases (to prevent high-water stranding of mussels); a paradoxical effect of the ramp-down limitations is the fact that storms centered over the southern part of the Basin may actually increase the drawdown of Lanier.

- Head limits at Jim Woodruff Dam – maximum allowable differential reservoir and tailwater levels relative to tailwater (to ensure stability of the dam).

- Lack of forecasting and operational hedging required to ensure at-site requirements are met with releases from upstream reservoirs precisely timed to ensure just-in-time flow delivery to Woodruff, causing spillage (inflow that cannot be stored) from the system.

- IOP and MIOP-required release rates greatly exceeding Woodruff's penstock capacity, necessitating large and less-precisely controllable spillway releases and corresponding loss of power generation.

- Inaccurate measurement of Woodruff releases (subsequently discussed under models and data below).

In summary, the MIOP improves upon the IOP, but, by preserving the basic dependency of IOP-required releases on Basin Inflow, remains less suited to management of the Basin than the 1989 WCP, notwithstanding the evolution of demands on water and storage since 1990. The IOP framework is fatally flawed because it attempts to artificially re-create a natural streamflow regime at the Basin outlet across a full range of flow conditions using reservoirs ill-suited (with low capture efficiency) to this purpose. It should be noted that the at-site purposes these reservoirs were designed and operated under the WCP to serve remain in effect under the IOP.

The futility of the effort notwithstanding, attenuation of hydrologic extremes and natural system response to inflows may not be especially beneficial to species. A subsequent comparison between drought operation under the WCP and the IOP provides indications that the IOP may not improve on the WCP, and may ultimately be worse by necessitating emergency curtailment of reservoir releases and unsustainable depletion of conservation storage. The most effective approach dictated by sound river basin management practice to preservation of natural flow regimes using limited storage is to set required minimum flows at the lowest possible levels to mitigate extreme low flows and prevent irreversible ecological harm. Such a regulation policy maintains reservoirs full most of the time, thus passing inflows most of the time and ensuring adequate water in storage for sustained periods of extreme low-flow augmentation. In sum, low minimum release requirements result in more natural flow regimes and sustainable flow augmentation during extreme droughts.

Low-flow augmentation during the dry summer and fall months can only be sustained if reservoirs are allowed to refill during the winter and spring – otherwise storage drawdown is unabated during extended droughts and system failure becomes a real possibility. Operation under various versions of the IOP during the past two years provides tangible evidence, specifically in the case of Lanier, which has experienced two years of virtually continuous drawdown since early 2006, interrupted only by (1) implementation of the EDO and (2) above-normal rainfall in December and January. Nonetheless Lanier is now at its lowest level at the beginning of May since it was initially filled, and under the MIOP – with higher demands on Lanier than imposed by the WCP – the threat of its conservation pool being emptied during the next 18 months is real. In the long run, should the IOP framework be incorporated within an updated ACF water control plan, water shortage crises will likely arise on a regular basis. Equally objectionable is the consequent foreclosure of options to meet future growth of a variety of demands on water and storage, specifically additional reallocation of conservation storage to municipal water supply.

4. **IOP and WCP operational comparison**

As previously described, the spring flow augmentation requirements under the IOP and MIOP conflict with the WCP objective to store high spring flows in advance of the normally-dry summer and fall months. In addition, however, the IOP and MIOP impose higher summer and fall minimum release requirements than the WCP. As a result, Lanier – the reservoir with annual carryover storage – is afforded less opportunity to refill than the smaller downstream reservoirs, creating an imbalance in system storage as experienced this spring, shown in Figure 7.

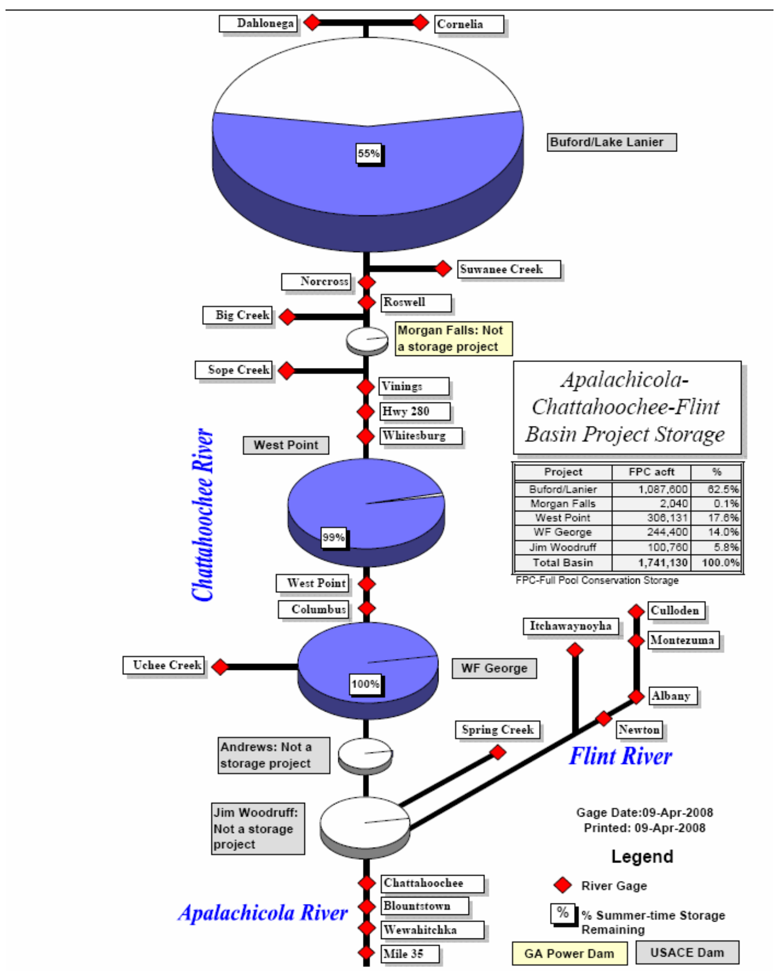


Figure 7: ACF system storage imbalance produced by IOP/EDO operations, April 2008

The significant departure of IOP-prescribed reservoir releases from the WCP apparent by examination of the operational data and comparison with system performance in previous basinwide droughts. Figure 8 displays Lanier daily pool elevations, observed prior to the WCP (1980–1990), under the WCP beginning in 1990, and under various iterations of the IOP beginning in 2006. Three regional multi-year droughts occurred during this 28-year span – 1980-1981, 1986 – 1989, 1998-2001, and 2006-2007 (ongoing). The 1980-1981 drought was relatively short but intense, producing the lowest lake level since Lanier was originally impounded in 1957. Operational adjustments were made to reduce the drawdown from 1986–1988, which at present still constitutes the lowest 3-year inflow period in Lanier's history. These adjustments were formalized in the 1989 WCP and served to comparatively reduce Lanier drawdown during the subsequent 1998–2001 4-year drought.

The stabilizing influence of the WCP in comparison to prior operational practice is well suited to prevention of excessive and protracted drawdown of Lanier – containing as previously noted 70-80% of composite storage at full seasonal pool. Figure 8 indicates that the duration of the critical period for Lanier, i.e. time of lowest inflows relative to demands on storage, has averaged 3-4 years. Under the IOP, the 2-year drawdown since 2006 has exceeded total drawdown in any previous period of any duration, despite the fact that, as shown in Figures 9 and 10, 3-year Basin Inflow and Lanier inflow volumes are not the lowest of record.

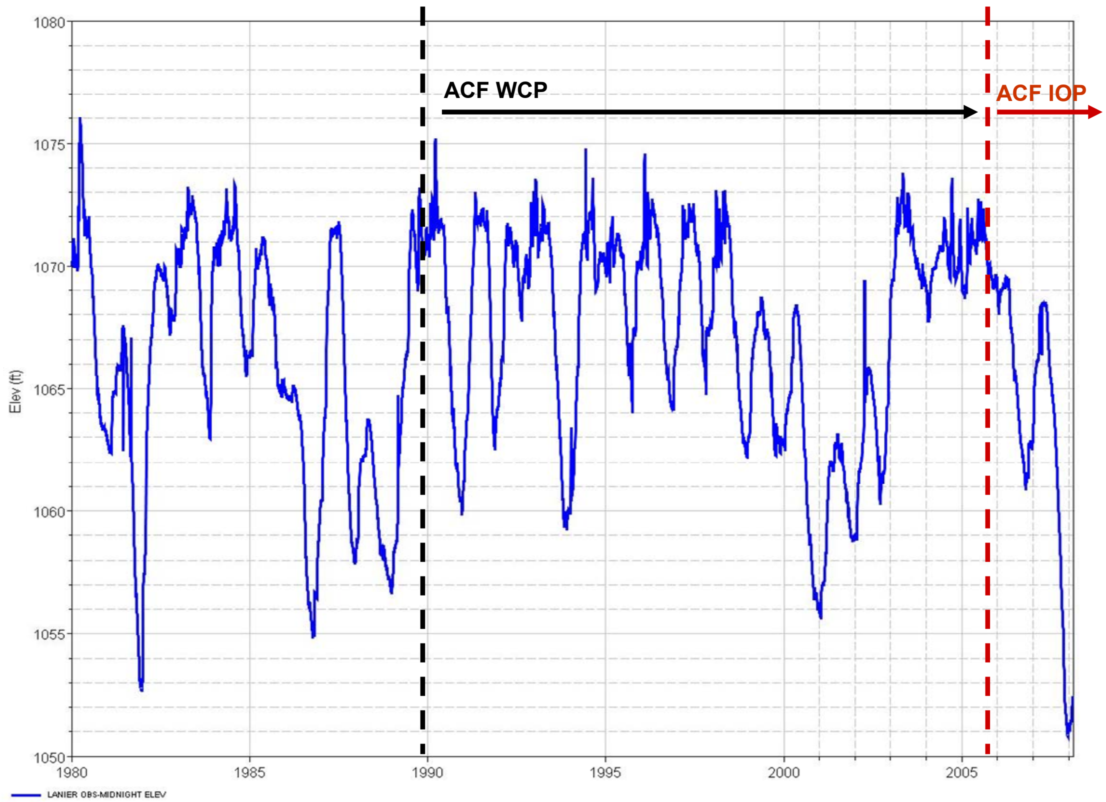


Figure 8: Lanier observed daily pool elevation, 1980–2007

Side-by-side comparisons of WCP operation from 1999–2000 and IOP operation in 2006 and 2007 strikingly reveal that the principal cause of the rapid drawdown of the system is not the severity of the drought, but the additional demands placed on the system by the IOP. Figures 11 – 15 compare monthly Basin Inflows and reservoir releases for 1999-2000 under the WCP, and 2006-2007 under the IOP.

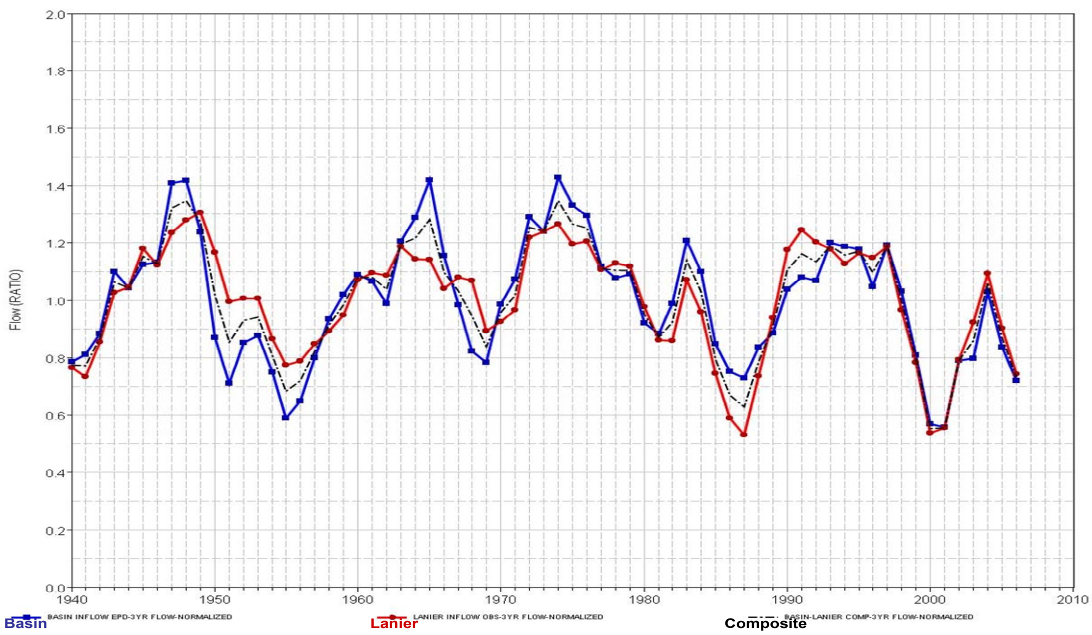


Figure 9: Normalized 3-year BI and Lanier inflow volumes, 1940 – 2007

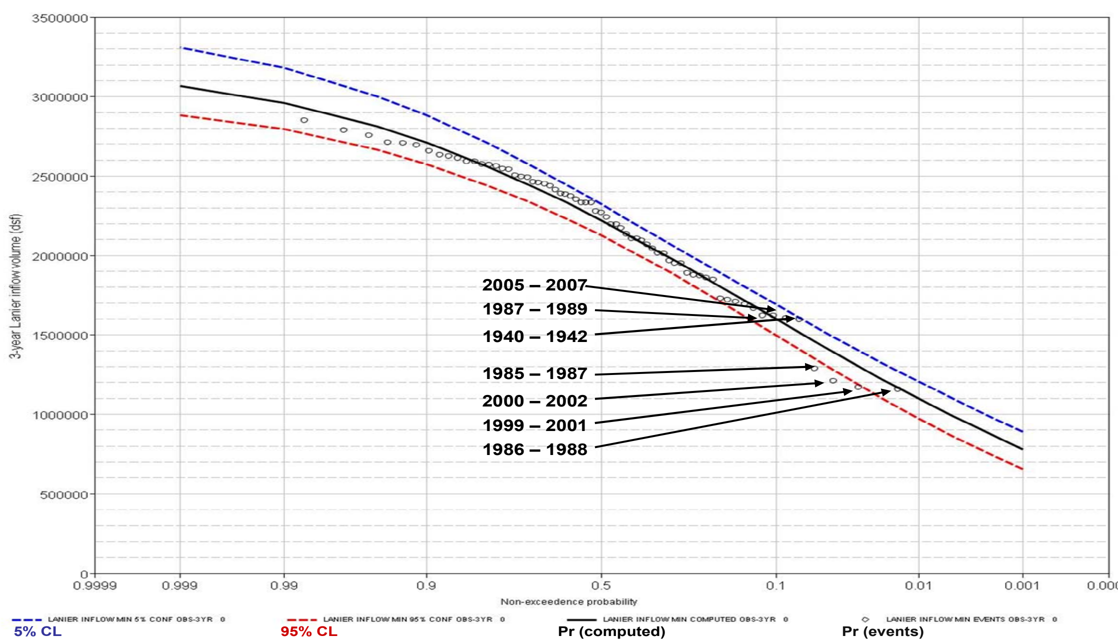


Figure 10: 3-year Lanier inflow volume-frequency curves (Log-Pearson Type III) and ranking

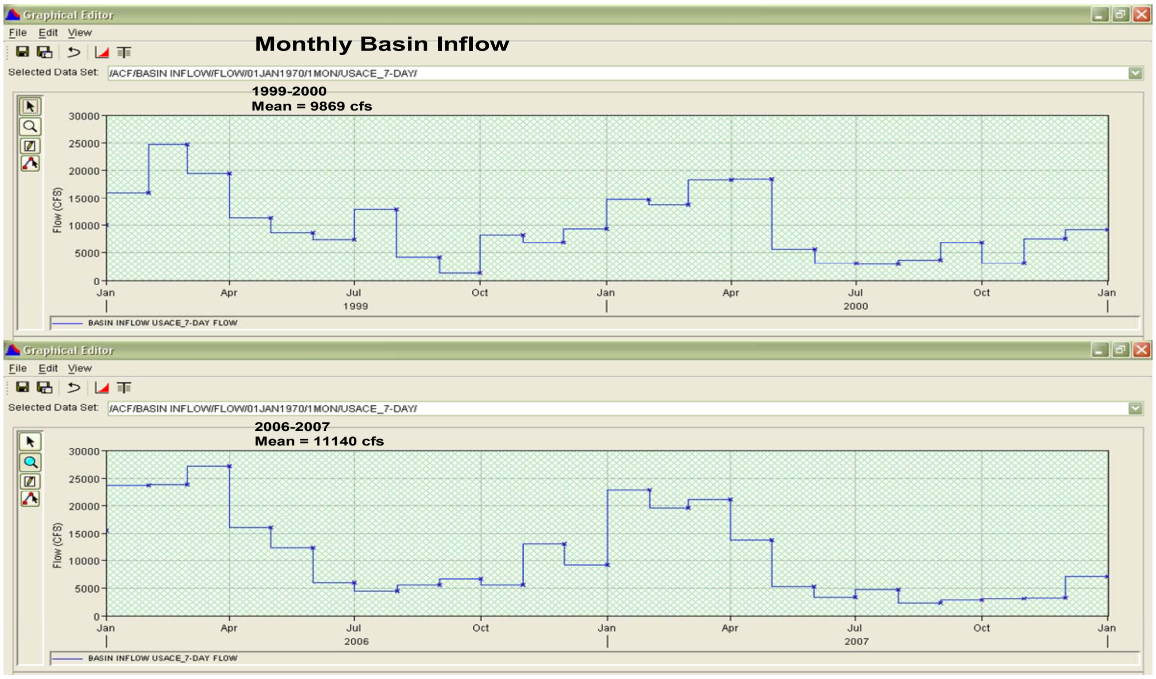


Figure 11: Monthly Basin Inflow, 1999-2000 (WCP) and 2006-2007 (IOP)

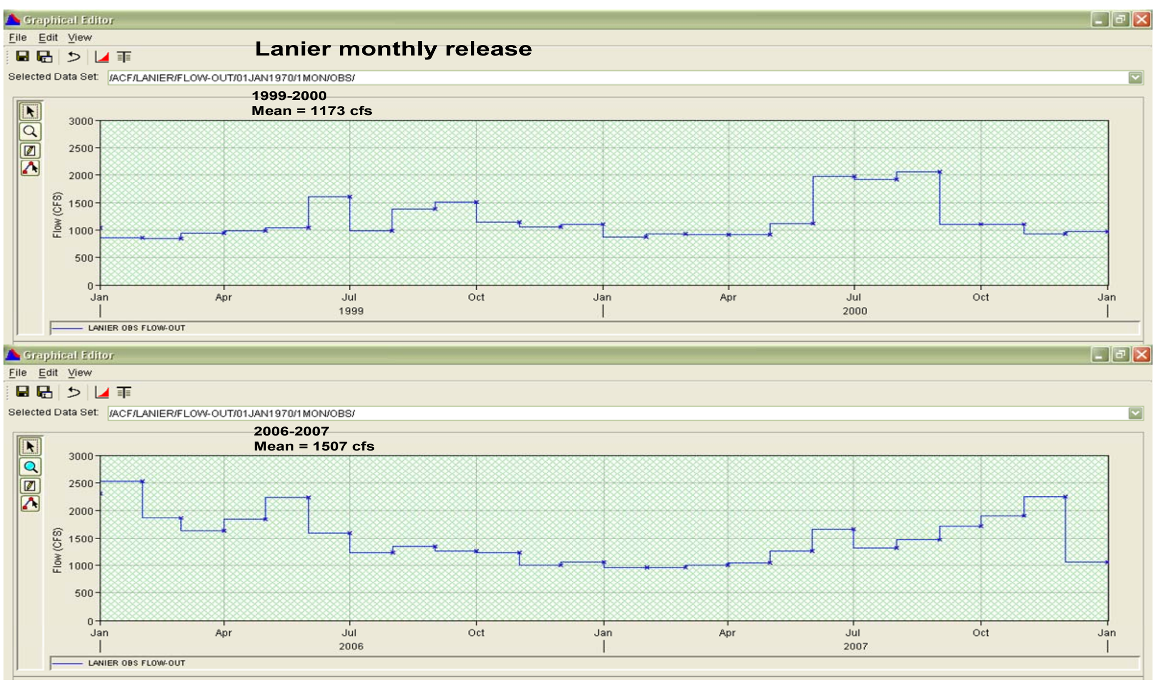


Figure 12: Lanier monthly release, 1999-2000 (WCP) and 2006-2007 (IOP)

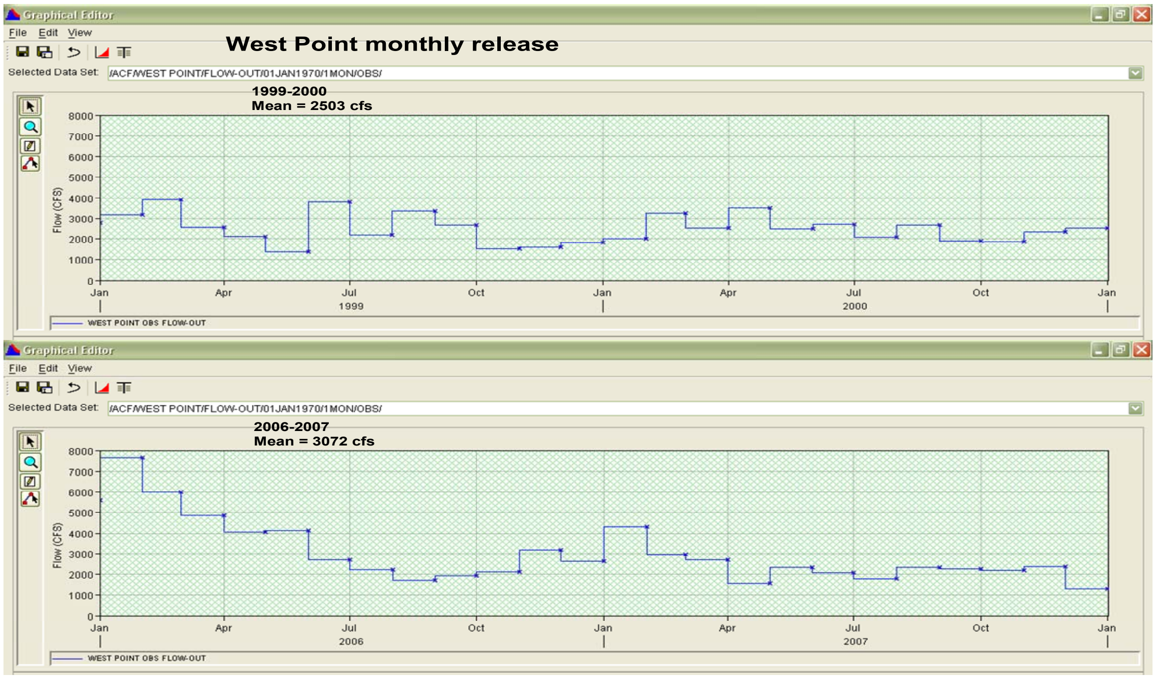


Figure 13: West Point monthly release, 1999-2000 (WCP) and 2006-2007 (IOP)

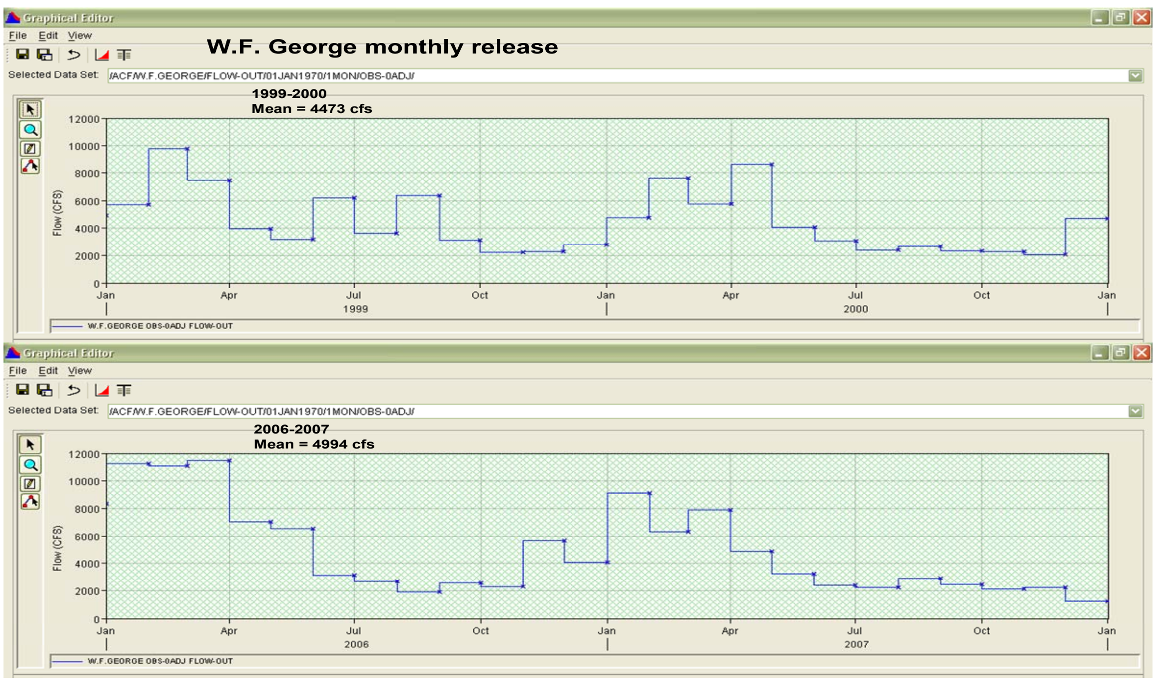


Figure 14: W.F. George monthly release, 1999-2000 (WCP) and 2006-2007 (IOP)

Figure 15: Jim Woodruff monthly release, 1999-2000 (WCP) and 2006-2007 (IOP)

The foregoing analysis identifies the major points of departure of the IOP from the WCP with respect to management for fish and wildlife, flood control, hydropower, navigation, recreation, water supply and water quality. A comparison, summarized in Table 3, of ACF project releases under the two operational policies reveals the differences to be significant and predictable, i.e. that IOP operation during historical droughts as or more severe than the current drought would have resulted in much greater drawdown of the storage reservoirs than actually occurred under the WCP.

	1999-2000 (WCP) average	2006-2007 (IOP) average	IOP/WCP ratio	BI-adjusted IOP/WCP ratio
Basin Inflow (BI) (cfs)	9,869	11,140	113%	113%
Lanier release (cfs)	1,173	1,507	128%	145%
West Point release (cfs)	2,503	3,072	123%	139%
W.F. George release (cfs)	4,473	4,994	112%	126%
Jim Woodruff release (cfs)	9,968	10,681	107%	121%
Jim Woodruff release/BI ratio	101%	96%	NA	NA

Table 3: WCP–IOP Concept 5 drought operational comparison

The fact that Woodruff released more of Basin Inflow from 1999-2001 under the WCP than from 2006-2007 under the IOP may signify that the IOP unsustainably over-utilizes system storage, necessitating EDO curtailment of releases to avert system collapse, ultimately to the detriment of all purposes including endangered species the IOP was intended to protect. However, potential errors in measurement of Basin Inflows and/or project releases (subsequently addressed in the forensic analysis) might also contribute to this finding.

4. **Forensic analysis – models and data applied for analysis of IOP**

Countless models were developed by the Corps, the States and the ARC to analyze the effects of various IOP formulations on the ACF system using period-of-record historical flows, selected and/or re-sequenced drought years of record, as well as synthesized low-flow conditions designed as bounding low-flow condition, for example day-of-year percentile flows determined by time-series cyclic analysis of the historical record. Numerous severe droughts in the historical record notwithstanding, the Corps models failed to predict the rate or extent of system storage drawdown actually experienced in 2006 and 2007, and in some instances indicated the IOP to be equivalent to or slightly improve upon the WCP. My impression from review of these models is that they failed to accommodate operational imprecision and hedging in a meaningful way, omitted important information in some instances and incorporated outdated information in others. All models necessarily simplify reality, and without careful consideration of potential errors or bias introduced by underlying assumptions, models may produce idealized results and fail as a result to predict the true limitations on the system's capacity for intense river regulation of the kind imposed by the IOP. Some of the data and assumptions embodied in the Corps' models that in my opinion might cause the models to significantly underestimate the impacts of the IOP on the ACF reservoirs are as follows:

- Turbine/generator performance data for Lanier do not reflect the new, larger units recently installed, which potentially increase releases per hour of full-capacity generation by 25% or more than the original units for which performance data and penstock capacity are specified in the current HEC-5 models. The HEC-5 models may substantially underestimate Lanier power releases under the IOP as a result.

- Lack of channel routing provisions in the models potentially understates the precision with which – and operational hedging needed to ensure – releases from upstream reservoirs are made and move through the system in time to enable IOP-mandated releases from Woodruff. In the current models, no time lag occurs between water released from upstream reservoirs and inflow to downstream reservoirs, and thus model-prescribed releases assume "perfect" knowledge of system conditions.

- Large spillway releases from Woodruff are necessary to comply with the IOP and in some instances to maintain net head (differential head and tailwater levels) within allowable limits. The HEC-5 models impose maximum tailwater levels, but do not require minimum releases (and tailwater levels) over IOP requirements needed ensure that limitations on maximum head shown in Appendix A, Chart 12a of the July 1985 revised Reservoir Regulation Manual are not violated. Because releases to maintain allowable head are also subject to the ramp-down requirements of the IOP, significant spillage in excess of IOP minimum flow requirements can be expected and have in fact occurred during 2006 and 2007, causing significant over-releases and drawdown of system storage in comparison to model-simulated results.

- The Corps has acknowledged significant imprecision in measurement of Woodruff releases, especially large spillway releases, and has as consequently substituted Chattahoochee Gage data for Woodruff releases. Stream gages do not measure flow directly, but instead apply empirically-derived rating curves to convert measured river stage to flow. Rating curves are imprecise and subject to change for a variety of reasons, and flow measurement errors of less than 10% are rare. As subsequently shown by forensic analysis, published Woodruff releases appear to be significantly less than actual (relative to published computed inflows), from which it may be concluded that significantly more water is actually released from Woodruff than applied in the derivation of incremental and/or unimpaired flows input to the models.

- Some of the models appear to base ramp-down on Basin Inflows rather than previous-day Woodruff releases. Ramp-down limits are imposed when Woodruff releases for any purpose, including head limits. Ramp-down is more restrictive at lower flows, and thus models basing ramp-down on Basin Inflows will in general underestimate system storage drawdown in comparison to previous-day Woodruff releases.

- The Corps Concept 5 models incorrectly assumed that most Atlanta-area municipal wastewater returns occur upstream of Atlanta, rather than in the Whitesburg reach downstream of Atlanta; the result of this assumption is an underestimation of Lanier releases to maintain the 750-cfs Peachtree Creek minimum flow requirement.

- The volumetric balancing provisions of the Concept 5 IOP were not incorporated into the Corps' HEC-5 models, but, because they are over-constrained, in reality provide little benefit and thus would not be expected to significantly affect the models.

Daily cumulative inflows to the reservoirs may be derived based on measured project releases and changes in storage, applying the continuity equation as follows:

$$I = \Delta S + O$$

Where I represents cumulative observed inflow (inclusive of evaporation, water diversions and returns), ΔS change in storage, and O reservoir outflow. Local inflows are derived by subtracting upstream reservoir releases (if applicable) from downstream cumulative inflows.

In order to assess the accuracy and consistency of the basic data used to derive the historical and unimpaired local inflows applied in the HEC-5 and other models to evaluate the IOP, I developed a specified-release model designed to reconstitute observed reservoir elevations by forcing each reservoir to make actual releases (measured by the Corps) with observed incremental inflows computed as previously described. Comparison of observed versus reconstituted reservoir levels from 1976 – 2007 (the common operational record all the four projects) reveals the extent to which the Corps' published data satisfy the continuity requirement, or alternatively cause water to be created or lost in the system. Violation of continuity may imply inaccuracies in observed or computed time-series data, reservoir elevation-storage data, or both. Inaccurate time-series data input to the models will render the models used for analysis of system performance likewise inaccurate, regardless of the operating rules imposed. Results of specified-release simulations for the four ACF Corps reservoirs are shown in Figures 16 – 19.

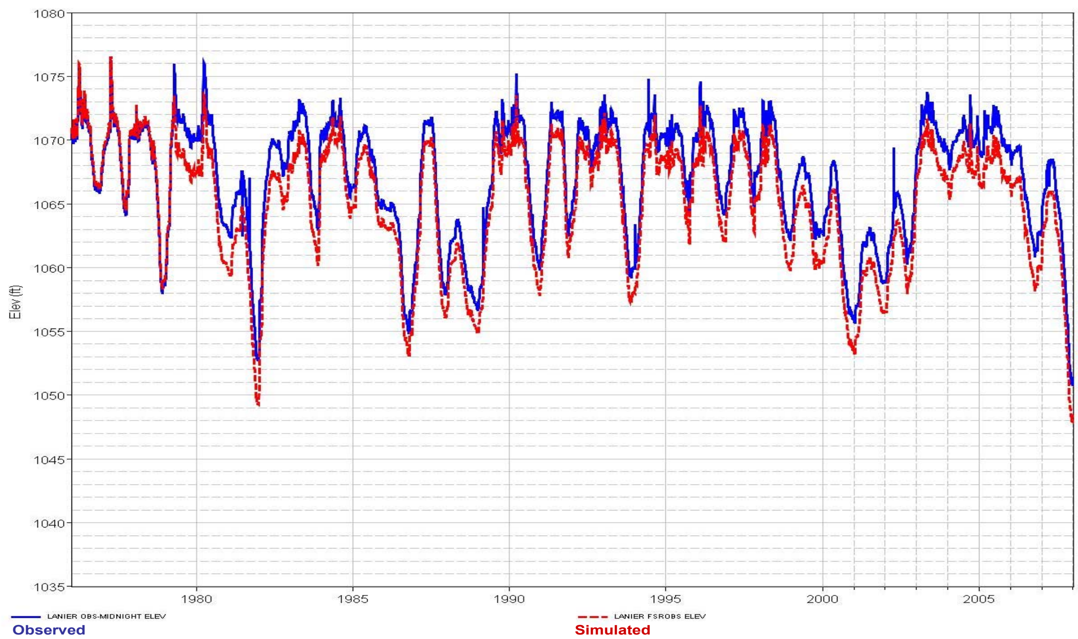


Figure 16: Lanier observed and reconstituted elevations, 1976–2007

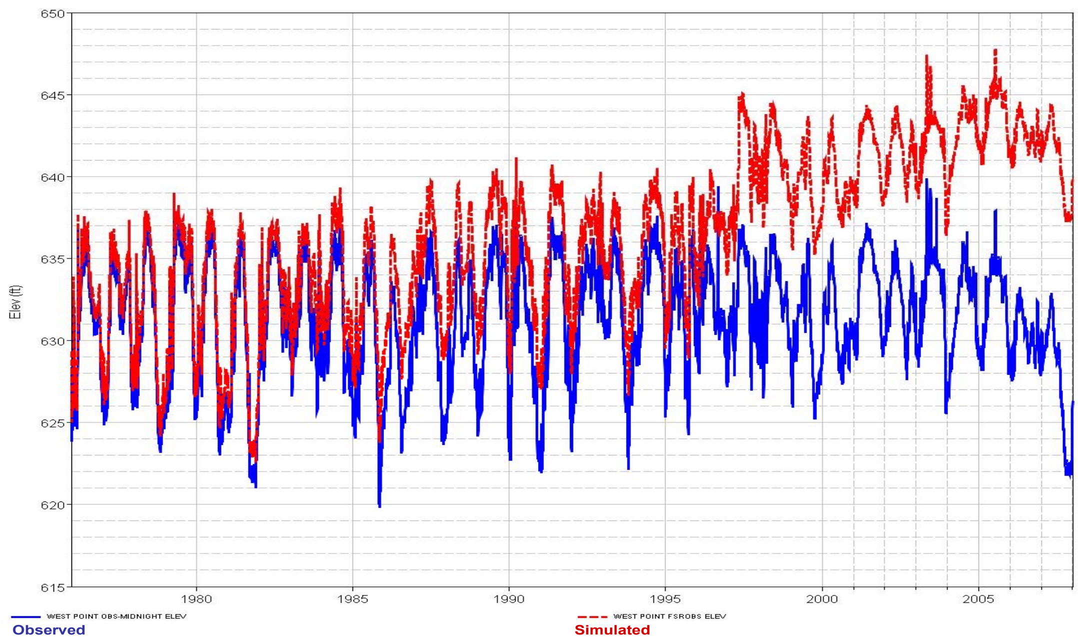


Figure 17: West Point observed and reconstituted elevations, 1976–2007

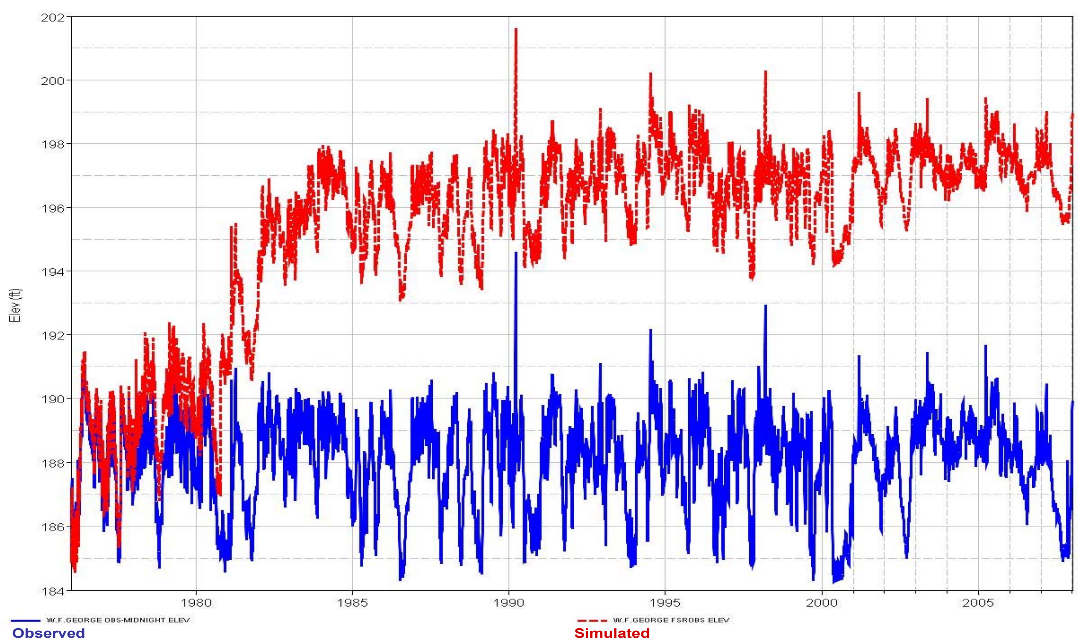


Figure 18: W.F. George observed and reconstituted elevations, 1976–2007

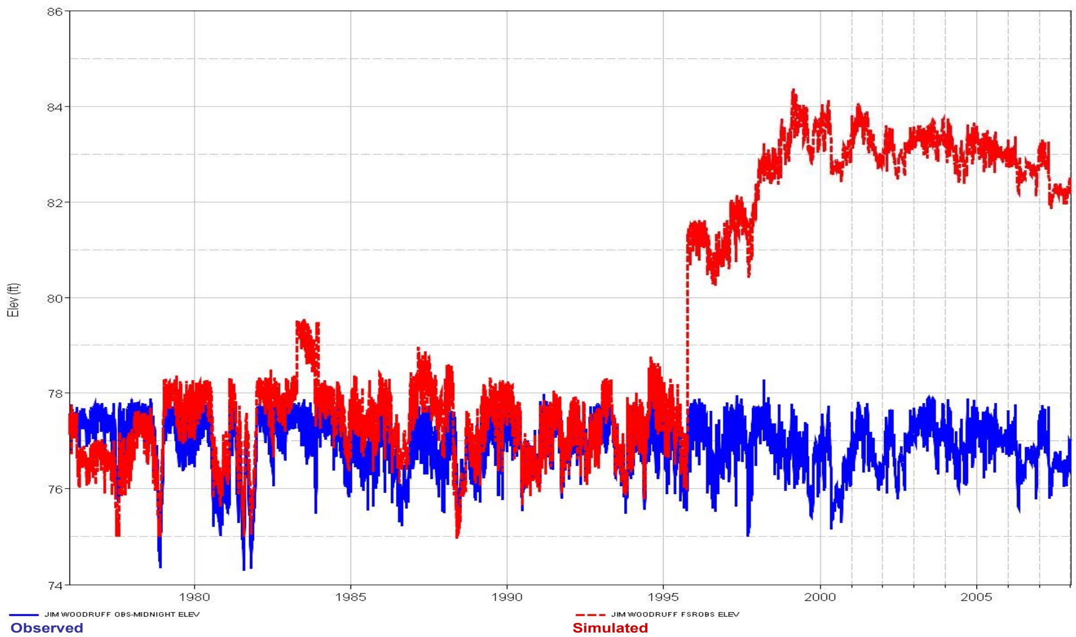


Figure 19: Jim Woodruff observed and reconstituted elevations, 1976–2007

The forensic simulation, results of which are summarized in Table 4, shows that nearly 62% of total system conservation storage is added to the system (roughly equivalent to Lanier's entire conservation pool) over the 30-year period of analysis.

	Cumulative reconstituted–observed ∆(storage) (af)	**% ∆(total conservation pool)**
Lanier	-87,012	-8.00%
West Point	334,358	109.22%
W.F. George	480,699	212.79%
Jim Woodruff	283,366	703.94%
Total	**1,026,411**	**61.76%**

Table 4: Summary of specified-release model results

One conclusion to be drawn from the forensic analysis is that Corps-computed inflows, based on measured reservoir releases and observed changes in storage, may be higher than actual. Consequently local incremental flows, unimpaired flows, Basin Inflows and other derived time-series input to the operational models may be overestimated as well.

5. Summary and conclusions

The foregoing comments address the weaknesses of the IOP framework for multipurpose reservoir operation and integrated management of the ACF Basin, IOP points of departure from the 1989 ACF WCP, and potential problems with models and data that could result in underestimation of the impacts of IOP operation on the system during droughts.

Weaknesses of IOP: Concept 6 improves slightly on the Concept 5 IOP but remains poorly-suited for water management to meet all competitive demands on water and storage in the Basin. General deficiencies of the IOP framework are as follows:

- Requirement for intense regulation of Basin outflows across a full spectrum of hydrologic conditions, from drought to above-normal, throughout the Basin
- Inadequate reservoir system storage positioned to effect IOP regulation, i.e. low capture efficiency of Basin Inflow
- WCP seasonal rule curve refill in conflict with IOP spawning release requirements
- Unsustainable over-utilization of conservation storage and imposition of unacceptable risks of system failure, significant reduction in annual probability of refill from the WCP, and redistribution system storage balance from upstream to downstream (i.e. maintaining upstream reservoirs less full than downstream reservoirs), in contravention of basic principles of sound water management.
- Over-utilization of system storage with current demands, foreclosing opportunities for future operational change and/or reallocation of storage to most beneficial uses

IOP and WCP operational comparison: The IOP framework substantially alters WCP priorities and procedures for meeting fish and wildlife, flood control, hydropower, navigation, recreation, water supply and water quality objectives. As a consequence these purposes are significantly impacted by the IOP, and IOP arguably is subject to the authorization and NEPA compliance requirements of water control plan revision.

Comparison of drought operational data under the WCP and the IOP indicates that the IOP appears to liberally draw down system (esp. Lanier) storage in the initial months, creating an emergency situation and curtailment of releases later. The more conservative and less-intense regulation prescribed by the WCP approach leaves more water in storage, avoids the need for emergency measures, and arguably outperforms the IOP in maintenance of natural seasonal flow regimes and low-flow augmentation.

Models and data applied to IOP analysis: Problems and inconsistencies exhibited in the data and assumptions applied to operational simulation of the IOP include those as follows:

- Outdated turbine/generator performance data for Lanier
- Lack of channel routing and accommodation of operational hedging in models
- Incomplete accommodation of Woodruff head limits in models
- IOP requirements for large spillway releases from Woodruff Dam
- Uncertainty and/or errors in measurement of Woodruff releases
- Ramp-down of Woodruff releases based on Basin Inflows as opposed to previous-day releases (in some models)
- Incorrect distribution of municipal water withdrawals and returns upstream of Whitesburg Gage
- Lack of model accommodation of volumetric balancing RPM3 measure

The specified-release forensic models disclose potentially significant mass-balance errors in the Corps' published reservoir inflows and/or releases since 1976. Errors in these basic data could, if unresolved or accommodated in some way, translate to computed incremental (observed and unimpaired) flows input to the models.

Discounting the effects of potential errors in historical project inflow and/or release time-series data, these problems will result in a tendency of the models to minimize operational inefficiencies ('wasted' water and storage) due to (1) complexity, impracticality and incompatibility some of the IOP provisions with the WCP, (2) availability and reliability of forecast and real-time hydromet data needed for day-to-day water control under the IOP, and (3) physical limitations of the system. The models would thus underestimate the true effects of the IOP on project releases and resulting drawdown of conservation storage.

Conclusions: The IOP appears to be a poorly-conceived and weak framework for integrated management of the ACF system to meet a variety of competing objectives. The MIOP partially relaxes some of the IOP provisions and appends to it the EDO, yet the EDO provisions are only activated only after system refill during a reasonable period of time, e.g. one year, is made nearly impossible. While the MIOP improves on improvement on the IOP, it does not restore the level of risks faced by users of water and storage to WCP levels, principally because it retains the fatally-flawed IOP framework for full-spectrum regulation of Basin Inflow by a reservoir system with conservation storage inadequate to this purpose. The Corps has asserted that the original and subsequent versions of the IOP fall within the framework of the 1989 WCP, but as shown above the IOP significantly alters system storage and reservoir release patterns from the WCP. The Corps omitted critical details in the models and data used to formulate the IOP, and more importantly failed to draw fully on its institutional record of experience, knowledge and lessons learned in day-to-day ACF operations, water control planning, and involvement in the ACT/ACF Comprehensive Study and subsequent water allocation negotiations. To its credit, the Corps now appears to be incorporating more conservative assumptions in the models and data used for analysis of the MIOP.

Apart from scientific necessity of environmental flow regimes the MIOP is intended to assure, the over-riding conclusion to be drawn from the foregoing analysis is that the MIOP is extremely inefficient and physically/hydrologically ill-suited to this purpose. As a consequence, the MIOP wastes valuable water and jeopardizes all economic and environmental uses of storage in the ACF Basin. The established and emerging purposes for which the system has been historically managed will be damaged by water wasted in disjunctive MIOP operations, and the opportunity costs may be even greater should the MIOP form the basis of an ‘updated’ ACF Water Control Plan that forecloses opportunities for future operational adaptations to changing demands on water and storage. Assuming the flow regimes prescribed by the MIOP are needed, they could more reliably be effected by more efficient operating rules tailored to at-site demands, hydrology, existing purposes, and physical limitations applicable to each of the ACF reservoirs. At-site operating rules can be carefully formulated to maximize conjunctivity of releases and produce equivalent or better flow regimes for species protection in the lower ACF Basin while allowing the reservoirs to remain full more of the time. For example, rules can be formulated that reconcile spring storage refill and spawning release requirements by reduction or elimination of seasonal drawdown and refill induced by rule/guide curves – helping to balance system storage and equalize risks and refill chances among all reservoirs. Alternatively or in concert, operating rules that minimize flow augmentation requirements based on sustainable yield most reliably prevent extreme low flows and assure release of natural inflows through mostly-full reservoirs, in contrast to the repetitious and artificial drawdown/refill cycles induced by the MIOP.

Due to its low capture efficiency, the ACF reservoir system can only marginally alter the timing of Basin outflows relative to inflows. The value of the MIOP relative to the risks imposed have yet to be determined. As shown above, the IOP and MIOP manifestly alters WCP-prescribed reservoir releases. Environmental benefits notwithstanding, the economic impacts of IOP implementation to date, coupled with prospects for future water shortages under the MIOP, appear to be significant at best and socially unacceptable at worst. The previous analysis also discloses significant uncertainties and biases in the models used for analysis of the IOP and MIOP. Given these risks and uncertainties, the IOP appears to qualify for Independent Peer Review under Section 2034 of PL 110-114 (Water Resources Development Act of 2007) to assure the Corps' supporting analysis and basis for implementation are sound.

EXHIBIT E

Streamflow Depletions in the Flint River Basin Caused by Irrigation Pumping from the Floridan Aquifer in Drought Years

	Depletions Caused by Groundwater Pumping*			Depletions Caused by Surface Water Withdrawals	Total**	
	Spring Creek Gage (cfs)[1]	Bainbridge Gage (cfs)[2]	Total GW (cfs)[3]	Total SW (cfs)[4]	cfs	mgd[5]
January	-	-	-	-	-	-
February	-	-	-	-	-	-
March	3.8	42	46	48	94	60
April	8.8	79	88	92	179	116
May	32.9	252	285	297	582	375
June	40.9	320	361	376	737	476
Jul	33.7	338	372	388	759	490
Aug	29.5	352	382	398	779	503
Sept	21.9	341	363	378	741	478
Oct	10.5	220	231	240	471	304
Nov	8.3	171	179	187	366	236
Dec	4.7	130	135	140	275	178
Average			**203 cfs**	**212 cfs**	**415 cfs**	**268 mgd**

Source: Flint River Basin Regional Development and Conservation Plan (Mar. 20, 2006)

*Actual groundwater withdrawals for irrigation are much higher.

**Depletions for municipal and industrial use within the Flint River Basin are not included.

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[1] *See* Flint River Basin Regional Development and Conservation Plan ("FRB Plan") at 111, Table 6.2(c) ("Backlog" column). Spring Creek is a former tributary of the Flint River that now flows directly into Lake Seminole.

[2] *See* FRB Plan at 112, Table 6.2(e) ("Backlog" column).

[3] Numbers in this column exclude minor streamflow reductions from irrigation pumping within the Ichawaynochaway Creek drainage area. See FRB Plan 110, Table 6.2(a).

[4] The FRB Plan does not provide monthly data for surface water withdrawals. It does state, however, that "approximately 250 mgd [387.5 cfs] are used basin wide by agricultural surface water withdrawals in July (the peak month) of a typical irrigation season during a drought year." FRB Plan at 15. The estimates of monthly use and yearly average provided in this column were derived by assuming that surface water withdrawals vary seasonally in the same manner as groundwater withdrawals, which we believe is a safe assumption.

[5] The conversion between mgd (millions of gallons per day) and cfs (cubic feet per second) is as follows: 1 mgd = 1.55 cfs; 1 cfs = .646 mgd.