APPENDIX D

COORDINATION DOCUMENTATION

APPENDIX D
List of Correspondence and Other Documentation

D-1 Mobile District (CESAM) letter to U.S. Fish and Wildlife Service (USFWS), dated 7 March 2006, Request to Initiate Formal Section 7 Consultation on the Jim Woodruff Dam Interim Operations Plan (IOP)

D-2 USFWS letter to CESAM, dated 9 March 2006, Acknowledgement of Initiation of Formal Section 7 Consultation

D-3 Memorandum for Record of 25 April 2006 Telecon with USFWS regarding possible adjustments to IOP

D-4 Memorandum for Record of 24-25 May 2006 Hydrological Modeling Technical Workshop

D-5 CESAM letter to USFWS, dated 12 June 2006, Request for Adjustments to the IOP

D-6 USFWS letter to CESAM dated 13 June 2006, Request for Extension of Consultation Period

D-7 CESAM letter to USFWS dated 28 June 2006, agreement to extension of consultation period until 5 September and request for conference report on mussel critical habitat

D-8 CESAM letter to Trey Glenn, Alabama Department of Environmental Management (ADEM) dated 15 May 2006, invitation to 24-25 May 2006 Hydrological Modeling Technical Workshop

D-9 ADEM-Glenn letter to CESAM dated 12 June 2006

D-10 CESAM letter to ADEM-Glenn dated 7 July 2006, response to 12 June 2006 letter and invitation to follow-on Hydrological Modeling Technical Workshop

D-11 Florida Department of Environmental Protection (FDEP)-Castille letter to CESAM dated 9 March 2006, requesting formal consultation be initiated

D-12 CESAM letter to FDEP-Castille dated 21 March 2006, responding to 9 March 2006 letter

D-13 CESAM letter to FDEP-Castille dated 15 May 2006, invitation to 24-25 May Hydrological Modeling Technical Workshop

D-14 FDEP-Castille letter to CESAM dated 5 June 2006

D-15 CESAM letter to FDEP-Castille dated 28 June 2006, notice of 45-day extension of consultation period, and invitation to follow-on Hydrological Modeling Workshop

D-16 Georgia Environmental Protection Division (GA-EPD) letter to CESAM and USFWS dated 24 March 2006

D-17 GA-EPD letter to CESAM dated 5 May 2006, with modeling memorandum

D-18 CESAM letter to GA-EPD dated 15 May 2006, response to 24 March and 5 May letters and invitation to 24-25 May 2006 Hydrological Modeling Technical Workshop

D-19 GA-EPD letter to CESAM dated 17 May 2006

D-20 CESAM letter to GA-EPD dated 19 May 2006

D-21 GA-EPD letter to CESAM and USFWS dated 1 June 2006

D-22 GA-EPD letter to CESAM and USFWS dated 2 June 2006, with modeling memorandum

D-23 Georgia Governor Perdue letter to Secretary of the Army Harvey dated 2 June 2006, requesting adjustments to IOP and extension of consultation period

D-24 GA-EPD letter to CESAM dated 9 June 2006

D-25 CESAM letter to GA-EPD dated 12 June 2006, interim response to 9 June 2006 letter

D-26 CESAM letter to GA-EPD dated 12 June 2006, responding to GA-EPD letters dated 1 June and 2 June 2006, noting proposed adjustments to IOP and agreement to extend consultation period by 45 days

D-27 CESAM letter to GA-EPD dated 21 June 2006, response to 9 June letter and notice of follow-on hydrological modeling workshop

D-28 GA-EPD letter to CESAM and USFWS dated 28 August 2006, forwarding Memorandum from Dr. Douglas Peterson, University of Georgia

D-29 Southeastern Power Administration (SEPA) letter to CESAM dated 25 May 2006

D-30 SEPA letter to CESAM dated 8 June 2006

D-31 CESAM letter to SEPA dated 11 June 2006, including Memorandum of Record of 24-25 May 2006 Hydrological Modeling Technical Workshop and invitation to follow-on hydrological modeling workshop

D-32 Atlanta Regional Commission letter to CESAM dated 17 August 2006

D-33 Hydrological Modeling Technical Workshop – 12 July 2006

D-1 Mobile District (CESAM) letter to U.S. Fish and Wildlife Service (USFWS), dated 7 March 2006, Request to Initiate Formal Section 7 Consultation on the Jim Woodruff Dam Interim Operations Plan (IOP)

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

REPLY TO
ATTENTION OF

March 7, 2006

Inland Environment Team
Planning Environmental Division

Ms. Gail Carmody
Ecological Services
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), and your concurrence with a determination that the U.S. Army Corps of Engineers (Corps), Mobile District water management operations at Jim Woodruff Dam, and the associated releases to the Apalachicola River, are not likely to jeopardize the continued existence of federally listed species or result in the adverse modification or destruction of designated critical habitat. Mobile District's plan for operations will also not foreclose future options available in issuing new reasonable and prudent alternative measures. Therefore, the proposed water management operations at Jim Woodruff Dam are consistent with Section 7(d) of the ESA.

The Apalachicola River is known to support three federally listed species: Gulf sturgeon (*Acipenser oxyrhinchus desotoi*), fat threeridge mussel (*Amblema neislerii*), and purple bankclimber mussel (*Elliptoideus sloatianus*). The U.S. Fish and Wildlife Service (USFWS) and National Marine Fisheries Service (NMFS) listed the Gulf sturgeon as threatened on September 30, 1991 (56 FR 49653). The USFWS listed the fat threeridge mussel as endangered and the purple bankclimber mussel as threatened on March 16, 1998 (Federal Register, vol. 63, no. 50, pp. 12664–12687). The USFWS and NMFS designated critical habitat for the Gulf sturgeon on March 19, 2003 (Federal Register, vol. 68, no. 53, pg. 13370). Critical Habitat Unit 6 includes the main stem of the Apalachicola River from the Jim Woodruff Lock and Dam, Gadsden and Jackson Counties, Florida, downstream to its discharge at East Bay or Apalachicola Bay, Franklin County, Florida.

Jim Woodruff Dam was constructed in 1957 and represents the most downstream Federal reservoir project within the Apalachicola, Chattahoochee, Flint Rivers (ACF) system. The reservoir projects in the ACF system include Jim Woodruff Dam (Lake Seminole), George W. Andrews Dam and Lake, Walter F. George Dam and Lake, West Point Dam and Lake, and Buford Dam (Lake Sidney Lanier). The ACF system is authorized and operated for multiple project purposes, including flood control, hydropower generation, navigation, water quality, fish and wildlife conservation, water supply and recreation. The Mobile District operates the reservoirs within the ACF system in a balanced manner in an attempt to benefit all project purposes. Retention of water in reservoir storage is used for the benefit of these multiple project purposes. Storage also provides a source for augmentation flows in support of downstream needs during periods of extended dry conditions or drought. The Jim Woodruff project is essentially a "run-of-river" project with very limited storage capabilities. Therefore, storage in upstream reservoirs must often be released in order to make controlled releases from Jim Woodruff Dam to meet downstream flow needs. Current operations under the draft ACF water control plan require a minimum flow of 5,000 cfs on the Apalachicola River to meet minimum water supply and fish and wildlife needs during low flow conditions.

The USFWS has previously requested the Mobile District to initiate consultation under Section 7 of the ESA for existing water control operations within the ACF system, as well as formal consultation for proposed updates or revisions to water control plans necessary to implement water supply reallocations in the basin. The Corps and the USFWS have previously agreed that consultation on updates or revisions of the water control plans represents the most appropriate mechanism to address the impacts of water management operations on endangered or threatened species in the basin. For a number of reasons, Mobile District has not to date been able to proceed with updates to the water control plans for the basin. In 1989, Mobile District proposed to update the ACF water control plan to reflect existing operations in the system, issuing a draft water supply reallocation report for Lake Lanier and draft water control plan for the ACF system. However, litigation filed by the State of Alabama in 1990 prevented the Mobile District from finalizing this water control plan. A proposed update to the water control plan was further delayed while the States of Alabama, Florida, and Georgia and the Corps participated in a comprehensive study of the water resources in the basin and possible mechanisms for allocation of water resources and management of the basin. As a condition to a Memorandum of Agreement between Alabama, Florida, Georgia, and the Corps, executed on January 3, 1992, the Corps withdrew the water supply reallocation report and draft water control plan and ceased any further processing of the documents. The comprehensive basin study led to recommendations for an ACF River Basin Compact in 1997, and negotiations between the States of Alabama, Florida, and Georgia on a water allocation formula for the ACF basin proceeded until August 2003, when the Compact expired without reaching agreement on an allocation formula. Litigation was then re-activated by the States of Alabama and Florida, and the Mobile District was unable to proceed with water reallocations or changes to the water control plan until a recent U.S District Court decision ruling that the Corps should expeditiously begin implementation of the Southeastern Federal Power Customers Inc. v. U.S. Army Corps of Engineers settlement agreement. As part of implementation of the settlement agreement, Mobile District intends to update the ACF water control plans to reflect existing operations, and to formally consult with the USFWS pursuant to Section 7.

Although Mobile District could not previously initiate consultation on overall project operations associated with a revision or update of the water control plan, the Mobile District has informally consulted with USFWS regarding the potential for impacts to the endangered and threatened species on the Apalachicola River, and possible adjustments to operations at Jim

Woodruff Dam and its releases into the Apalachicola River that could minimize or avoid impacts to or enhance the conservation of the species. This informal consultation has been conducted over the past six years. Information developed during the informal consultations, including data collection and analysis of habitat distribution and flow requirements, will assist in developing a biological assessment for future formal Section 7 consultation on the impacts of proposed updates to the water control plans for the ACF basin. The USFWS and Mobile District have previously agreed to complete this data gathering and analysis for input into the biological assessment prior to the initiation of formal Section 7 consultation on the water control plans.

In the meantime, the purpose of this letter is to request initiation of formal consultation under Section 7 of the ESA on our existing operations at Jim Woodruff Dam, and to describe how we intend to operate the Jim Woodruff Dam during the remainder of calendar year 2006 and until formal Section 7 consultation can be completed on our the existing water control plans for the ACF basin. We have determined that our existing operations at Jim Woodruff Dam are implemented in a manner that may affect but minimizes impacts to the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, and the two listed mussel species to the maximum extent practicable. Our operations at Jim Woodruff Dam and releases to the Apalachicola River are not likely to jeopardize the continued existence or result in any irreversible or irretrievable commitments of resources, nor foreclose the development of any reasonable and prudent alternatives to avoid jeopardy of the listed species, nor are our operations likely to significantly adversely modify or destroy designated critical habitat for the Gulf sturgeon. This letter also explains the basis for our determination. Our current proposal is consistent to the maximum extent practicable with USFWS recommendations received to date in previous informal consultations that focused on very specific operational concerns, such as a particular navigation window, minimum flows for mussels during drought periods, or reducing flow during the fish spawning season. Unlike previous informal consultations, our current proposal also describes operations more generally for the rest of the year.

Since the spring of 2000, the Mobile District has been informally consulting with the USFWS, pursuant to Section 7 of the ESA, regarding water management operations and releases from Jim Woodruff Dam to the Apalachicola River and possible modifications to project operations that would minimize or avoid impacts to Gulf sturgeon and the fat threeridge and purple bankclimber mussels. By letter dated April 28, 2000 (Enclosure 2), the USFWS advised the Mobile District that fluctuating water levels associated with a navigation window conducted in late April and early May of 2000 were detrimental to spring spawning activities in the upstream reservoir projects and the Apalachicola River, and could potentially impact Gulf sturgeon spawning activities or host fish for listed mussel species. USFWS offered to assist in providing guidance on water management operations in support of fish spawning within both reservoir projects and the Apalachicola River, and requested a meeting to discuss the impacts of current operations. By letter dated June 13, 2000 (Enclosure 3), Mobile District agreed to meet with the USFWS in order to discuss current water management operations and ways to balance operations in support of both fishery resources in the federal reservoirs and the Apalachicola

River; the potential for impacts to the Gulf sturgeon and protected mussel species; whether informal or formal consultation would be required; and to identify whether adjustments to project operations could be made to minimize or avoid impacts to these species. A summary of the results of this meeting were provided in a letter from USFWS dated October 12, 2000 (Enclosure 4). As a result of these discussions, Mobile District has been actively conferring with the USFWS and State fishery agencies on numerous occasions, and adjustments were made in existing operations at Jim Woodruff Dam to support fish spawning activities in both upstream reservoirs and the Apalachicola River, including specific operations in support of Gulf sturgeon spawning activities. Revisions to regulatory guidance and a draft Standard Operating Procedure (SOP) on fish management activities have been developed in consultation with USFWS, and annual coordination meetings are scheduled prior to fish spawning season to assist in planning for water management operations in support of fishery resources during low flow conditions.

In the summer of 2000, continued drought conditions in the ACF basin prompted concern that storage from upstream reservoirs could become depleted to the extent that releases to meet the 5,000 cfs minimum flow on the Apalachicola River could not be sustained indefinitely if dry conditions persisted in the summer and fall months. At that time, Mobile District began to informally consult with USFWS regarding the potential for impacts to protected mussels if releases were to be reduced below the 5,000 cfs minimum flow. By letter dated August 10, 2000 (Enclosure 5), USFWS advised that reduction of releases from Jim Woodruff Dam below 5,000 cfs may adversely affect the federally listed mussel species, and requested that formal consultation be initiated pursuant to Section 7 of the ESA in the event the drought contingency measure was pursued. By letter dated November 17, 2000 (Enclosure 6), Mobile District documented the informal consultation activities that had occurred since August 2000 to determine the potential for impacts on mussels in the event of a possible drought contingency measure to reduce releases to the Apalachicola River below 5,000 cfs. Although the drought contingency measure was no longer being pursued at that time, Mobile District agreed to continue to informally consult and collect data for a biological assessment in the event a similar drought contingency measure was proposed at a future date. The ongoing data collection and informal consultation efforts have resulted in completion of a study of the potential effects of low flow conditions on the protected mussel species. A draft report was submitted to USFWS in January 2006 (Enclosure 7) and is currently under review by Mobile District and USFWS.

Drought conditions within the ACF basin continued into 2002, and low flow conditions were experienced during the course of fish spawning activities that spring. USFWS notified the Mobile District by letter dated June 11, 2002 (Enclosure 8), that the low flow conditions had potentially impacted Gulf sturgeon spawning activities. USFWS suggested a meeting to discuss the potential impacts of reservoir operations on fish spawning activities and Section 7 consultation responsibilities relative to the Gulf sturgeon and protected mussel species. A copy of the Memorandum for Record documenting the meeting discussions on August 12, 2002, is enclosed (Enclosure 9). Following this meeting, USFWS and Mobile District developed a strategy and approach for additional data collection and analysis that would be incorporated into a biological assessment of the impacts of low flow operations on the protected species in the Apalachicola River. This biological assessment would assist in determining whether impacts of project operations may adversely affect the federally protected species and whether formal consultation would be required, pursuant to Section 7 of the ESA.

In March 2003, USFWS listed critical habitat for the Gulf sturgeon. Unit 6 of critical habitat includes the Apalachicola River main stem, beginning from the Jim Woodruff Lock and Dam, Gadsden and Jackson Counties Florida, downstream to its discharge at East Bay or Apalachicola Bay, Franklin County. The lateral extent of Unit 6 is the ordinary high water line on each bank of the river. Primary constituent elements comprising critical habitat for this species include: (1) Abundant prey items within riverine habitats for larval and juvenile life stages, and within estuarine and marine habitats and substrates for juvenile, subadult, and adult life stages; (2) riverine spawning sites with substrates suitable for egg deposition and development, such as limestone outcrops and cut limestone banks, bedrock, large gravel or cobble beds, marl, soapstone or hard clay; (3) riverine aggregation areas, also referred to as resting, holding and staging areas, used by adult, subadult and/or juveniles, generally, but not always located in holes below normal riverbed depths, believed necessary for minimizing energy expenditures during fresh water residency and possibly for osmoregulatory functions; (4) a flow regime (i.e., the magnitude, frequency, duration, seasonality, and rate-of-change of fresh water discharge over time) necessary for normal behavior, growth, and survival of all life stages in the riverine environment, including migration, breeding site selection, courtship, egg fertilization, resting, and staging, and necessary for maintaining spawning sites in suitable condition for egg attachment egg sheltering, resting, and larvae staging; (5) water quality, including temperature, salinity, pH, hardness, turbidity, oxygen content, and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; (6) sediment quality, including texture and other chemical characteristics, necessary for normal behavior, growth, and viability of all life stages; and (7) safe and unobstructed migratory pathways necessary for passage within and between riverine, estuarine, and marine habitats.

As a result of our informal consultation discussions, Mobile District has initiated several studies or data gathering efforts to assist in assessment of the potential for impacts of water management operations on endangered or threatened species in the Apalachicola River, and to assist in identifying possible modifications to project operations that could minimize or avoid impacts to protected species and other fishery resources, or enhance the conservation of these species. Below is a summary of specific actions resulting from the informal consultations between Mobile District and USFWS relating to the Gulf sturgeon and protected mussel species in the Apalachicola River.

Gulf Sturgeon

- <u>Discontinuation of the use of routine navigation windows and rescheduling any other special water management actions outside the fish spawning periods.</u> Navigation windows were devised in response to the 1986 and 1988 droughts in order to provide for planned shipments by the ACF waterway users during extended low flow periods when flows were not sufficient to provide a sustained available channel. During periods of low flow from 1990 until 2000, navigation was limited to brief periods of time, or navigation windows, when water stored in the upstream reservoirs was released to increase river flows for periods of 10 days to two weeks to provide a minimal usable navigation channel depth. Flows on the Apalachicola River were reduced in the periods prior to navigation windows as water was stored in the upstream reservoirs in preparation for the upcoming scheduled navigation window. Water would then be released during the navigation window period, resulting in a temporary increase in flows on the Apalachicola River, and then reduced again following completion of the navigation window in order to conserve water for other project purposes or in preparation for the next scheduled navigation window. Beginning in the mid 1990s, navigation windows were routinely scheduled in advance, approximately one per month during the low water months, in order to provide the waterway users a predictable reliable channel. Because channel conditions were also deteriorating, navigation windows were used with increasing frequency, as many as six a year, generally between May and December. Maintenance of navigation depths became increasingly dependent upon flows due to continued channel degradation and a lack of adequate dredged material disposal capacity. In the 1990s, the discharges from Jim Woodruff Dam required to provide a limited 8-foot channel during navigation windows ranged from 13,000 cfs to over 20,000 cfs, dependent upon the condition of the dredged channel and whether dredging had been completed. During the 1990s, the use of navigation windows also became increasingly controversial due to drawdowns in upstream reservoirs during releases for the navigation window, and due to reduced flows on the Apalachicola River during periods when releases were restricted prior to the navigation window (in order to store water for the navigation release) and following completion of the navigation window (in order to refill storage in upstream reservoirs). Due to increased controversy and the larger fluctuations of reservoir and river levels experienced during the sustained drought conditions, the routine use of navigation windows was discontinued after the navigation window in the spring of 2000.

There has been no routine navigation window scheduled since the spring of 2000. Instead, the use of limited controlled navigation releases has been coordinated with Federal and State agencies, various stakeholders, and the public on a case-by-case basis. Since 2000, these controlled releases were only scheduled for single critical shipments (e.g., shipment of steam generators to the Farley nuclear plant on the Chattahoochee River in December 2000; shipment of bridge component parts to or from Steward Machine on the Flint River in Bainbridge, Georgia in February 2003 and January 2004; and shipment of old reactor vessel heads from the Farley nuclear plant in January 2006). Mobile District only agreed to provide the controlled releases after reaching a determination that any resulting changes in reservoir levels or river stages would be minimal and would avoid any significant impacts on fisheries and other resources or uses of the system. These releases were closely coordinated for the single shipment and the limited releases provided only the minimum flow necessary to navigate past identified shoal areas on the river. Gradual ramping down rates following conclusion of the special navigation releases were made at rates of 0.5 foot per day or less. The single shippers were required to use reduced draft equipment and to schedule their shipment when anticipated rainfall in the basin would make impacts of fluctuating reservoir and river levels less pronounced. Flow releases in support of navigation, including scheduling of special navigation releases on a case-by-case basis, will continue to be provided, consistent with the Congressionally-authorized project purpose of navigation. Such releases for shipments are typically scheduled for high flow months of the year, and only limited flow augmentation support is provided. However, the Mobile District will continue to coordinate closely with the State and Federal agencies and the public to conduct the mandate to support navigation in a manner that minimizes or avoids impacts to the environment and other public resources or uses of the system. No navigation windows or flow support for special shipments is currently planned for 2006.

- <u>Update of Division Regulation DR1130-2-16 (Enclosure 10) and CESAM SOP 1130-2-9 (DRAFT) (Enclosure 11)</u>. These guidance documents were previously applied to provide support for reservoir fish spawning activities. However, in response to concerns raised by the Florida Fish and Wildlife Conservation Commission (formerly the Florida Game and Freshwater Fish Commission) in the springs of 2000 and 2002 the documents have been revised and updated in consultation with USFWS and state fish management agencies in order to provide for operations in support of both ACF species and reservoir species during the fish spawning season, and to provide for alternative special management plans for species of higher priority, such as the Gulf sturgeon. The draft SOP provides that during designated fish spawning periods, relatively stable or rising reservoir elevations would be maintained during a minimum 4 to 6-week period, and relatively stable or gradually declining river stages would be provided on the Apalachicola River. A goal was established for reductions in river stages at a rate of 0.5 foot per day or less, but not more than one foot per day (due to difficulties in manipulating releases at less than one foot per day). Weekly or periodic telephonic conferences would be scheduled with USFWS and the affected State agencies when the agency recommendations could not be met or if other special management considerations, such as operations in support of endangered or threatened species, were determined necessary. The revised draft SOP also provides for annual coordination meetings prior to the spawning season to discuss recommendations and priorities for special operations in support of the Gulf sturgeon, especially during declining basin inflow or low flow conditions. Reservoir operations and coordination protocols outlined in the draft SOP have been implemented since the spring of 2003 to provide support to fish spawning activities.

- Enhanced coordination and communications, and initiation of informal consultation discussions during fish spawn or low flow periods. Mobile District, USFWS and State fish management agencies have participated in annual pre-spawn coordination meetings to review the ACF system hydrological status and discuss recommendations for the management strategy for the upcoming spring. The pre-spawn coordination meetings were held in February 2003, 2004, 2005, and 2006 (Memoranda of Record of these meetings are enclosed at Enclosures 12 – 15). Supplemental weekly or periodic teleconferences occurred when the recommended operations could not be provided due to low flow conditions. In accordance with the coordination protocol included in the draft SOP 1130-2-9, several weekly or periodic teleconferences were conducted during the 2004 spring spawning months (Memoranda of several of these teleconferences are at Enclosures 16 - 23). As a result of these regular conferences, a low flow operations protocol was developed which provided releases from Jim Woodruff Dam to the Apalachicola River that equaled or exceed computed basin inflows in order to be protective of both Gulf sturgeon during spawning activities and mussels during sustained low flow conditions. Telephonic and email consultations were also initiated in May 2005 while Gulf sturgeon spawning was underway and basin inflows began to fall below the recommended 21,000 cfs, previously identified by USFWS as necessary to adequately inundated the rock ledge spawning habitat area at approximate Navigation Mile (NM) 105. A teleconference was conducted on 11 May 2005 (Memorandum for Record at Enclosure 24), at which time it was agreed that releases would be made to equal or exceed the computed 3-day average basin inflows with gradual ramping down of less than 0.5 foot per day. USFWS confirmed by email correspondence dated May 12, 2005 that this operation protocol during low flow operations would not result in a discretionary action adversely affecting the Gulf sturgeon (Enclosure 25). Flows were gradually reduced to approximately 14,000 to 16,000 cfs in concert with declining basin inflows. Additional follow-on email coordination on May 17, 2005 resulted in an agreement to provide sustained steady flows over the rock ledge for the remainder of the month of May, after spawning activity had concluded, in order to provide sufficient flows to allow sturgeon eggs and larvae to mature to the free-swimming stage (Enclosure 26). Releases were therefore made at a sustained rate approximating 16,000 cfs until June 1, 2005. Close coordination and regular consultations with USFWS provided for additional opportunities to provide protection for the species.

- Identification of important Gulf sturgeon spawning habitat at the rock ledge located immediately below Jim Woodruff Dam and associated flow requirements. During the 2004 coordination meeting the USFWS and Florida Fish and Wildlife Conservation Commission (FWCC) indicated that a minimum flow of approximately of 21,000 cfs would be required to fully inundate the rock ledge to a depth of approximately 4.6 feet (minimum depth of water over hard bottom at which sturgeon spawning has previously been documented in published data). At that time it was recommended that releases from Jim Woodruff Dam provide a minimum of 20,000 cfs during the month of March, 18,000

- Enhanced coordination and communications, and initiation of informal consultation discussions during fish spawn or low flow periods. Mobile District, USFWS and State fish management agencies have participated in annual pre-spawn coordination meetings to review the ACF system hydrological status and discuss recommendations for the management strategy for the upcoming spring. The pre-spawn coordination meetings were held in February 2003, 2004, 2005, and 2006 (Memoranda of Record of these meetings are enclosed at Enclosures 12 – 15). Supplemental weekly or periodic teleconferences occurred when the recommended operations could not be provided due to low flow conditions. In accordance with the coordination protocol included in the draft SOP 1130-2-9, several weekly or periodic teleconferences were conducted during the 2004 spring spawning months (Memoranda of several of these teleconferences are at Enclosures 16 - 23). As a result of these regular conferences, a low flow operations protocol was developed which provided releases from Jim Woodruff Dam to the Apalachicola River that equaled or exceed computed basin inflows in order to be protective of both Gulf sturgeon during spawning activities and mussels during sustained low flow conditions. Telephonic and email consultations were also initiated in May 2005 while Gulf sturgeon spawning was underway and basin inflows began to fall below the recommended 21,000 cfs, previously identified by USFWS as necessary to adequately inundated the rock ledge spawning habitat area at approximate Navigation Mile (NM) 105. A teleconference was conducted on 11 May 2005 (Memorandum for Record at Enclosure 24), at which time it was agreed that releases would be made to equal or exceed the computed 3-day average basin inflows with gradual ramping down of less than 0.5 foot per day. USFWS confirmed by email correspondence dated May 12, 2005 that this operation protocol during low flow operations would not result in a discretionary action adversely affecting the Gulf sturgeon (Enclosure 25). Flows were gradually reduced to approximately 14,000 to 16,000 cfs in concert with declining basin inflows. Additional follow-on email coordination on May 17, 2005 resulted in an agreement to provide sustained steady flows over the rock ledge for the remainder of the month of May, after spawning activity had concluded, in order to provide sufficient flows to allow sturgeon eggs and larvae to mature to the free-swimming stage (Enclosure 26). Releases were therefore made at a sustained rate approximating 16,000 cfs until June 1, 2005. Close coordination and regular consultations with USFWS provided for additional opportunities to provide protection for the species.

- Identification of important Gulf sturgeon spawning habitat at the rock ledge located immediately below Jim Woodruff Dam and associated flow requirements. During the 2004 coordination meeting the USFWS and Florida Fish and Wildlife Conservation Commission (FWCC) indicated that a minimum flow of approximately of 21,000 cfs would be required to fully inundate the rock ledge to a depth of approximately 4.6 feet (minimum depth of water over hard bottom at which sturgeon spawning has previously been documented in published data). At that time it was recommended that releases from Jim Woodruff Dam provide a minimum of 20,000 cfs during the month of March, 18,000 cfs during the month of April, and 14,000 cfs during the month of May for fish spawning purposes, with gradual ramping down rates of 0.5-foot per day or less. These recommendations were based on information on the elevations of the rock ledge that was available in the spring of 2002, and recognized that river stages typically gradually decline from high flows to lower stages during the spring months of April and May. During the period between the fall of 2002 and early 2004, Mobile District and USFWS have jointly surveyed and mapped potential Gulf sturgeon spawning habitat areas in the upper 20 miles of the Apalachicola River (see Enclosure 27 and 28). These data are currently being evaluated by Mobile District and USFWS to determine the amount of suitable spawning habitat available at various flow levels. The data are based on bathymetric and bottom habitat surveys collected by the Mobile District and USFWS at the rock ledge site and several other potential spawning habitat areas, with the area of hard bottom habitat correlated to flows measured at the U.S. Geological Survey (USGS) Chattahoochee gage.

Evaluation of mapped data at the rock ledge habitat below Jim Woodruff Dam has been recently completed, including a determination of the areal extent inundated and the areal extent inundated to a depth of 4.59 feet (USFWS indicates that this is the shallowest depth at which eggs have been collected per previously published data). The result of this evaluation provides the estimated acres of hard bottom habitat available for various flow levels between 4,900 cfs and 40,000 cfs (Enclosure 29). These data indicate that the highest portions of the 17.6-acre rock ledge is completely inundated at flows between 16,000 cfs and 18,000 cfs. At flows of approximately 30,000 cfs, the entire rock ledge habitat is inundated to a depth of 4.59 feet, which would provide access to spawning by Gulf sturgeon to the entire site.

Monitoring of Gulf sturgeon spawning activities were also completed during the 2005 spawning season, including collection of sturgeon eggs on egg pads placed over the rock ledge habitat. The highest flow at which sturgeon eggs were collected in 2005 was approximately 37,400 cfs on May 2, 2005, and the lowest flow at which sturgeon eggs were collected was approximately 20,400 cfs on May 13, 2005 (Enclosure 30). At a flow of 20,400 cfs, approximately 74 percent of the rock ledge area is inundated at a depth of 4.59 feet or greater, and therefore available for spawning.

This updated flow data collected to characterize the extent of rock ledge habitat at NM 105 inundated at various flows, and data collected to characterize when spawning occurred (i.e., flows at which eggs were collected in 2005), will be used to guide low flow operations in support of sturgeon spawning activities.

- Development of a low flow coordination and operations protocol to minimize or avoid impacts to Gulf sturgeon spawning activities. A "run of river" low flow operations protocol was agreed to in 2004 in an attempt to mimic the hydrologic conditions of a natural flow regime during low flow conditions and to minimize impacts to Gulf sturgeon from falling river stages. The low flow operations protocol would be implemented whenever it appears that flows on the Apalachicola River are falling or predicted to fall below the levels identified as necessary to fully support Gulf sturgeon spawning. Based on information available in 2004, the low flow operations protocol was to be initiated when flows were below approximately 21,000 cfs. The low flow operations protocol instituted in 2004 included ensuring that releases to the Apalachicola River approximated or exceeded inflows into the basin whenever basin inflows approached 21,000 cfs or lower. Basin inflows are determined by the computed 3-day average basin inflow. The timing and rate of any reductions in releases below the recommended minimal level of 21,000 were made commensurate with reductions in basin inflows and in consultation with the USFWS and the affected State fishery agency. Any reductions in releases were made as gradually as possible, approximating 0.5 foot per day or less, but no more than 1 foot per day, and remained at or above the computed basin inflows. Releases and proposed reductions in releases would take into account whether any additional rainfall is anticipated within the basin in the next few days and the predicted impacts on storage in upstream reservoirs due to sustained augmentation of flows above basin inflows. It was also recognized that some reservoir storage should be conserved in the spring months during sustained dry periods in order to provide sustained augmentation flows in support of the needs of protected mussel species during the later summer or fall months, which are typically the driest part of the year. This low flow operations protocol was implemented in the spring and summer of 2004 and during May of 2005. USFWS determined in 2004 and 2005 that operating in accordance with the low flow operations protocol, with releases equal to or exceeding the computed 3-day average basin inflow, resulted in mitigating the impacts of declining basin inflows and did not represent a discretionary action impacting Gulf sturgeon spawning activities.

- <u>Collection of additional data on potential Gulf sturgeon spawning habitat</u>. As noted above, additional information has been collected to assist in identifying and implementing adjustments to existing project operations that could minimize, avoid, or enhance impacts to Gulf sturgeon. Beginning in the fall of 2002, Mobile District and USFWS began joint efforts to map the upper 20 miles of river to identify the locations and depths of potentially suitable Gulf sturgeon spawning habitat, and to identify at what flows these potential spawning habitat areas would be inundated and accessible to spawning sturgeon. Bathymetric surveys were taken at several cross-section across several potential spawning habitat areas on the river. Bottom samples were then collected over the transects in order to identify the extent of hard bottom habitat at each potential sturgeon spawning site. Field mapping was completed in early 2004. The habitat data is being analyzed and correlated with modeled flow rating data to determine the areal extent of sturgeon spawning habitat available at various flow levels. As noted above, analysis of the habitat data at the rock ledge located at approximate NM 105 has been completed and will be used to assist in guiding Jim Woodruff Dam releases in the spring of 2006. Bottom habitat and flow data collected to characterize the areal extent of other potential sturgeon spawning areas inundated at various flows will also be addressed during formal consultation to guide low flow operations in support of sturgeon spawning activities.

- Participation in monitoring of sturgeon migration and spawning activities. Mobile District purchased 15 radio tags that were placed by USFWS on mature Gulf sturgeon during the fall of 2004. Mobile District employees assisted in monitoring migratory movements and movements to sturgeon spawning habitat areas during spring 2005. Egg mats were also placed at potential sturgeon spawning habitat areas where sturgeon had been tracked to monitor for use and/or spawning success. Eggs were collected from pads placed over the rock ledge at NM 105 on four dates between April 27 and May 13, with pads at water depths ranging from 7.5 to 20.1 feet (summary of monitoring efforts in 2005 included at Enclosure 31). In the spring of 2005, monitoring data indicated that Gulf sturgeon spawning at the rock ledge habitat area had likely been completed by May 16, due to rising temperatures. However, stable flows were provided until June 1, at the request of USFWS in order to allow eggs and larvae to mature to the free-swimming stage. Monitoring of sturgeon spawning activities allows for transfer of information to assist in more effective operations in support spawning success. Data collected to characterize when and where spawning occurred (i.e., flows at which eggs were collected in 2005) will assist in guiding operations in support of gulf sturgeon spawning activities. Radio tracking and egg collection efforts by USFWS will continue in spring 2006.

Federally Protected Mussel Species

- Maintenance of minimum flows above 5,000 cfs during extended low flow or drought conditions. In 2000 it was agreed to continue to provide the 5,000 cfs minimum flow, as required under existing operations, and no waiver to reduce flows below the minimum 5,000 cfs has been requested or is planned. In the event drought contingency measures to reduce flows below 5,000 cfs are proposed in response to a future severe drought condition, Mobile District has agreed to initiate formal consultation at that time.

- Evaluating impacts of low flow levels on mussels. Mussel survey data that was collected during 1996, 1997, 1999, 2001, and 2002, and additional information on the depth distribution of protected mussel populations collected in 2003 has been evaluated in a low flow study conducted by the Corps Engineering Research Development Center. The evaluation included comparison of the depth distribution of mussels to flow/elevation data to estimate the percent of listed mussels that would be impacted by various low flow levels. This flow study was initiated to determine the impacts of any future drought contingency measure to reduce flows below 5,000 cfs, and mussel data was evaluated for flows of 6,000 cfs, 5,000 cfs, 4,000 cfs and 3,000 cfs. However, the data can also assist in determining potential impacts of low flow operations for flow conditions approaching

5,000 cfs. This information is summarized in a draft report, which was provided to USFWS for review and comment in January 2006 (See Enclosure 7). Supplemental data has also been recently developed, to demonstrate the distribution and depth of mussels at flows from 10,000 cfs to 6,000 cfs. This data shows that a few *A. neislerii* begin to become exposed when river stages fall below 8,000 cfs, but that most of the populations of *A. neislerii* occur at substrate depths that could become exposed by flows less than 7,000 cfs. (Enclosure 32). This data will assist in guiding operations at Jim Woodruff during low flow operations in support of mussel species.

- Initiation of informal consultation during low flow conditions. Periodic consultations with USFWS and other resource agencies has been initiated during low flow conditions to discuss ways to adjust releases in a manner that minimizes or avoids impacts to listed mussels as well as mitigates for decreases in basin inflows. This type of consultation occurred in the late spring and summer of 2004 during low flow conditions.

- Adoption of a low flow operations protocol. Through the informal consultation discussions with USFWS during the extended dry conditions experienced in 2004, a low flow operations protocol was implemented in order to provide releases from Jim Woodruff Dam in support of protected mussels on the Apalachicola River. Information available at that time was developed during the low flow mussel study and indicated that significant percentages of the fat threeridge mussel population occur at locations inundated by 6,000 cfs or below. In the late spring of 2004, as basin inflows declined to approximately 8,000 cfs and were anticipated to further decline and approach 6,000 cfs, informal consultation discussions with USFWS were initiated to determine operations at Jim Woodruff Dam that would minimize impacts to the mussels during the sustained low flow period. Releases during the extended dry conditions in the late spring and summer of 2004 were made in consultation with the USFWS, with efforts to maintain releases above 6,500 cfs for as long as possible. Gradual reductions in releases from Jim Woodruff Dam were made in several telephonic consultations with USFWS as basin inflows were declining. During these teleconferences, a determination was made on the timing and rate of any further gradual reductions in releases, while maintaining releases that approximated the computed 3-day average basin inflow or greater. Gradual reductions in flow resulted in decreases in stage of less than 0.5 foot per day, and usually in the range of 0.25 foot per day. As noted above, information in the low flow mussel study has been recently supplemented to determine the distribution and depth of mussels impacted by flows between 6,000 cfs and 10,000 cfs. This information demonstrates that significant percentages of *A. neislerii* occur at substrate depths inundated at flows of 7,000 cfs or less, with relatively few *A. neislerii* mussels occurring at substrate depths inundated by flows between 7,000 cfs and 8,000 cfs. No *A. neislerii* were found at substrates depths inundated by flows above 8,000 cfs. This information will be used to guide low flow operations at Jim Woodruff dam in support of listed mussels.

As demonstrated above, informal consultation discussions with USFWS and data collection and evaluation conducted since 2000 has resulted in adjustments to existing project operations at Jim Woodruff Dam that have minimized or avoided impacts to protected species due to low flow operations. We have enclosed charts depicting the releases made from Jim Woodruff Dam to the Apalachicola River during extended dry conditions experienced during the period 2000 through 2005, and comparisons to the computed basin inflows (Enclosure 33). Additional charts are also provided that demonstrate the impacts on upstream reservoirs during the same periods (Enclosure 34) In most cases during sustained low flow or drought conditions, releases to the Apalachicola River have approximated the basin inflow or greater. Ramping down rates when flows are below 20,000 cfs have been made as gradually as possible, usually at rates of 0.5 foot per day or less. Storage from upstream reservoirs has been utilized to provide augmentation flows where needed, in order to achieve the desired gradual ramping down rates, and to maintain minimum flows above 5,000 cfs. Therefore, impacts to protected species during low flow conditions, when operations are carried out in accordance with the low flow operation protocols described above, have been determined to be the result of the naturally declining basin inflows and extended dry conditions. Efforts by the Mobile District to provide at least the basin inflow or greater did not represent a discretionary action to reduce releases to the Apalachicola River. Any releases to the Apalachicola River above the basin inflow represented mitigative measures to reduce the impacts of the declining basin inflow.

Basin inflows are currently computed based on the existing local inflows to each reservoir project. These computed local inflows are necessarily affected by existing withdrawals from tributaries, streams or un-impounded river sections, as well as other factors that affect natural run-off or inflows into the reservoir basins. Although the Corps has the authority to provide storage for water supply withdrawals from the Federal reservoirs or releases from Federal reservoirs for water supply withdrawals, which are permitted by the State of Georgia, most previous Federal water supply contracts expired by 1990 and have not been renewed due to ongoing litigation. The withdrawals and releases continued under the "live and let live" agreements while water allocation negotiations were underway, until the ACF Compact expired in 2003. Water supply withdrawals still continue today although no new water supply contracts or reallocations of storage were completed by the Mobile District while litigation continued. The impacts of the increased withdrawals from the Federal reservoirs since 1990, and any necessary revisions to the ACF basin water control plans, will be addressed by Mobile District during future studies and associated NEPA documentation necessary for implementation of new water supply contracts. The Mobile District does not control the substantial municipal or industrial water supply withdrawals which are made directly from the Chattahoochee and Flint Rivers or their tributaries, which also affect the availability of water in the system (direct withdrawals from the Chattahoochee River and Flint River and their tributaries within the State of Georgia are regulated and permitted by the State of Georgia). However, the computed average basin inflows reflect the quantity of water available within the ACF system at any given time.

Proposed Reservoir Operations at Jim Woodruff Dam for 2006

Mobile District began recent informal consultation discussions with USFWS in early 2006 with the intent of identifying operating conditions under which a determination that operations at Jim Woodruff Dam proposed for implementation in 2006 were not likely to adversely affect the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, and the two listed mussel species. The proposed operations plan was consistent with low flow operation protocols agreed to and implemented in 2004 and 2005, where releases would meet or exceed basin inflows whenever basin inflows fell to 21,000 cfs or lower; ramping rates of 0.5 or less would be imposed whenever flows were less than 20,000 cfs; and periodic consultations would be conducted with USFWS and the affected State agencies during the low flow operations to collaboratively agree on the timing and rate of any reductions in releases below 20,000 cfs. A similar low flow operations and coordination protocol would be implemented whenever flows approached 8,000 cfs or lower in order to protect mussels from exposure, with releases then matched to basin inflows or greater. USFWS had previously agreed that operating as described above would not represent a discretionary action by the Mobile District that adversely impacts the listed species; that any impacts on the listed species or critical habitat during these described operations would be considered the result of declining basin inflows; and that any augmentation above basin inflows would be considered a mitigative measure to reduce the impacts of declining basin inflows on the listed species or critical habitat. However, based on recently developed data and analysis on sturgeon critical habitat for spawning and the distribution and depth of listed mussels, developed through previous informal consultation efforts, USFWS has now proposed several additional operating conditions that would be necessary to support the determination of not likely to adversely affect the species. These conditions include limits on ability to refill the reservoirs during the spring refill months (i.e., 90 percent of basin inflows to be released during the months of March through May when basin inflows are between 20,400 cfs and 37,400 cfs, or when flows are less than 37,400 cfs or greater than 9,000 cfs during the months of June through February) which could prevent sufficient refill of reservoir storage during extended dry periods or drought conditions. If reservoirs cannot refill or if storage cannot be conserved during extended dry or drought periods, then there may not be sufficient storage available in the later months to augment flows for protection of mussels from exposure or to meet other resource needs, or to maintain flows above 5,000 cfs for extended periods. More stringent ramping rates were also recommended (i.e., 0.1 foot per day or less) than are operationally feasible given equipment constraints or operations safety concerns at the dam. Although Mobile District believes operations at Jim Woodruff Dam are currently and will continue to be conducted in a manner that minimizes impacts to listed species and critical habitat to the maximum extent practicable, there is no guarantee that listed species will not be adversely affected by discretionary actions taken by the Mobile District during low flow operations due to the potential trade-offs between managing for Gulf sturgeon and critical habitat needs during the spring months, and managing for augmentation flows in the later summer and fall months to prevent exposure of listed mussel species. Therefore, at the conclusion of informal consultation discussions undertaken with USFWS in early 2006, it has been mutually agreed that formal consultation on project operations at Jim Woodruff Dam and the resultant releases to the Apalachicola River will be initiated pursuant to Section 7 of the ESA. A summary of the proposed interim operations beginning in the spring of 2006 is included in the interim operations table (Enclosure 1). As previously noted, it is proposed to implement these interim operations until additional formal consultation is completed in association with the update and revision of water control plans for the ACF system. These interim operations concentrate on operations and releases from Jim Woodruff Dam to the Apalachicola River, taking into consideration composite storage available in upstream reservoir but not addressing detailed operations at the upstream reservoirs. Such detailed operations would be addressed during the future update of the existing water control plans for the ACF basin. Because the species and critical habitat areas of concern are all located only on the Apalachicola River downstream of Jim Woodruff Dam, the primary operational consideration at this time is the timing and quantity of flows released from the dam. When the ACF basin water control plans are updated and revised at a future date, an additional formal consultation will be initiated, and any necessary modifications to the operations at Jim Woodruff Dam will be considered at that time.

The 2006 Annual Fish Management Coordination Meeting was held on February 7, 2006. As a result of the discussions during this meeting, it was recommended by the interagency group that the low flow operations protocol guidelines established and implemented in 2004 should continue to be implemented during the upcoming fish spawning season. In 2006 it is proposed to conduct operations at Jim Woodruff Dam consistent with the informal consultation agreements and operations procedures implemented during Gulf sturgeon fish spawning and low flow conditions in 2004 and 2005. However, operations beginning in 2006 will be guided using updated information developed since the spring of 2005 on characteristics of the rock ledge spawning habitat at NM 105, flows at which successful spawning was completed at NM 105, and additional information on the depth and distribution of listed mussels. Gulf Sturgeon spawning activities generally occur during the months of March through May. Data collected from sturgeon spawning monitoring in 2005 indicate that flows of approximately 20,400 cfs or greater provided for successful spawning by Gulf sturgeon at the rock ledge located at approximate NM 105 on the Apalachicola River. The highest flow at which sturgeon eggs were collected at NM 105 in 2005 was approximately 37,400 cfs. Flows of 20,400 cfs provide for inundation of approximately 74 percent of the rock ledge at a depth of at least 4.59 feet, which is the shallowest documented depth for sturgeon spawning at other locations. The entire rock ledge is inundated to a depth of 4.59 feet by flows approximating 30,000 cfs. It is understood by both Mobile District and USFWS that releases of this magnitude cannot normally be maintained throughout the entire Gulf sturgeon spawning period. A review of historical hydrological conditions indicate that for flows of 21,000 cfs, 22 percent of the days in March, 34 percent of the days in April, and 64 percent of the days in May were less than 21,000 cfs, which documents that river stages typically decline gradually from seasonal high flows during the spring months (Enclosure 35). Recognizing the typical gradual decline in river stages, the USFWS and FWCC had previously recommended that releases from Jim Woodruff Dam be maintained at a minimum of 20,000 cfs during the month of March, and then gradually declining to a minimum of

18,000 cfs for the month of April and a minimum of 14,000 for the month of May in order to support fish spawning (Memorandum for Record of 17 February 2004 annual coordination meeting at Enclosure 13). In 2006 the Mobile District agrees to operate in accordance with the guidelines incorporated in the enclosed interim operations table (See Enclosure 1). This table incorporates operation parameters for releases from the Jim Woodruff Dam to the Apalachicola River as well as portions of basin inflows that would be reserved in order to refill upstream reservoirs for future augmentation flows or other critical project purposes. Ramping rates for various flow levels are also identified. Operations parameters in this table provide guidance for operations throughout the entire year, not just during the Gulf sturgeon spawning periods or low flow conditions. Outlining operations parameters for the entire year provides for protection of other life stages of the listed species or host fishes important for the reproductive life cycle of the listed mussels.

In accordance with the Interim Operations table parameters for the months of March through May, when basin inflows are greater than 37,400 cfs Mobile District agrees to release at least 37,400 cfs, but there is otherwise no limit on the amounts that can be stored for the increment of inflows above that amount. If basin inflows are less than 37,400 cfs but greater than 20,400 cfs during the March through May Gulf sturgeon spawning period, Mobile District agrees to release between 70 and 90 percent of basin inflows to the river, and the remainder may be stored to facilitate refill of reservoirs or to closely follow the conservation pool rule curve. The goal will be to release at least 90 percent of basin inflows during this period. However, in the event this release is not considered reasonable or prudent during extended dry periods or droughts (i.e., would prevent sufficient refill in the spring months or conservation of storage in the summer to fall months necessary for future augmentation flows), the Mobile District agrees to initiate additional informal consultation discussions with USFWS. During the informal consultation discussions, USFWS and the Mobile District will collaboratively agree on the percentage to be released, considering the current status of the reservoirs, predicted climatic conditions and anticipated rainfall, and the amount of storage that may be necessary to augment flows to prevent or minimize exposure of mussels and to maintain flows above 5000 cfs in the summer to fall months. At least 70 percent of basin inflows would be released. If basin inflows fall to 20,400 cfs or below, then Mobile District agrees to release at least the amount of basin inflow or greater to the river, and to conduct periodic informal consultation discussions (weekly or as determined necessary) with USFWS. During the informal consultation discussions, USFWS and the Mobile District will collaboratively agree on the timing and rate of any reductions in releases to the Apalachicola River below 20,400 cfs. Decisions on the timing and rate of any reductions in releases will be based on information on current basin inflows and predicted climatic conditions, the predicted impacts on reservoir storage of sustaining releases greater than the computed basin inflows, and any monitoring data on the progress or status of sturgeon spawning activities. Mobile District will implement reservoir operations at Jim Woodruff Dam and upstream reservoirs to provide the recommended releases to the Apalachicola River for as long as possible, based upon the computed 3-day average inflow into the basin, and predicted impacts on reservoir storage. During these operations, releases will be made from Jim Woodruff Dam to the Apalachicola River that approximate the computed 3-day average basin inflow or greater.

In accordance with the Interim Operations table parameters for the months of June through February, when basin inflows are greater than or equal to 37,400 cfs, Mobile District agrees to release not less than 37,400 cfs but may store the increment above 37,400 cfs. When basin inflows are less than 37,400 cfs but greater than 8,000 cfs, Mobile District agrees to release between 70 and 90 percent of basin inflows to the river, and the remainder may be stored to facilitate refill of reservoirs, closely follow the conservation pool rule curve, or to conserve storage for future augmentation releases. The goal will be to release at least 90 percent of basin inflows during this period. However, in the event this release is not considered reasonable or prudent during extended dry periods or droughts (i.e., would prevent sufficient refill or conservation of storage in the summer to fall months necessary for future augmentation flows), the Mobile District agrees to initiate additional informal consultation discussions with USFWS. During the informal consultation discussions, USFWS and the Mobile District will collaboratively agree on the percentage to be released, considering the current status of the reservoirs, predicted climatic conditions and anticipated rainfall, and the amount of storage that may be necessary to augment flows to prevent or minimize exposure of mussels and to maintain flows above 5,000 cfs in the summer to fall months. At least 70 percent of basin inflows would be released during this range of basin inflows. If basin inflows fall to 8,000 cfs or below, then Mobile District agrees to release at least the amount of basin inflow or greater to the river, and to conduct periodic informal consultation discussions (weekly or as determined necessary) with USFWS. During the informal consultation discussions, USFWS and the Mobile District will collaboratively agree on the timing and rate of any reductions in releases to the Apalachicola River below 8,000 cfs. Decisions on the timing and rate of any reductions in releases will be based on information on current basin inflows and predicted climatic conditions, the predicted impacts on reservoir storage of sustaining releases greater than the computed basin inflows, and the need to provide augmentation releases to maintain flows above 5,000 for a sustained period. Mobile District will implement reservoir operations at Jim Woodruff Dam and upstream reservoirs to provide the recommended releases to the Apalachicola River for as long as possible, based upon the computed 3-day average inflow into the basin, and predicted impacts on reservoir storage. During these operations, releases will be made from Jim Woodruff Dam to the Apalachicola River that approximate the computed 3-day average basin inflow or greater.

When operating to balance releases from Jim Woodruff Dam with the computed average basin inflow as described for the Gulf sturgeon spawning period or during implementation of the low flow operation protocol, upstream reservoirs will generally be kept at a stable level, while river stages will be stable and/or gradually falling depending on the available basin inflow. However, it should be noted that it normally takes a few days to bring the reservoir levels back to the rule curve after a substantial rain event, and the Mobile District practice is to gradually lower back to the top of conservation pool rule curve following the rain events, while making beneficial use of the water captured in the reservoir. Beneficial use can mean use for other project purposes (e.g., hydropower) as well as maintaining more stable river stages by controlling releases. Controlled releases will generally be "smoothed" to avoid any abrupt fluctuations in river stages when there is less than 20,400 cfs flow. The gradual step down of reductions in river stage will be limited to approximately

0.5 foot per day or less when feasible. Various system constraints and limitations may affect the Mobile District's ability to release increased and/or steady flows during spring spawning months. These may also impact the ability to meet the goal of ramping down releases at a rate of 0.5 foot per day or less. Structural head limits dictate release rates from Jim Woodruff Dam whenever the tailwater elevation is at or below approximate +44.5 feet (approximately 15,000 cfs flow produces a tailwater elevation of +44.5 feet), and may require immediate increases in discharge to reduce the pool elevation, increase the tailwater elevation, and reduce the head differential. Other considerations when attempting to meet the recommended step down rate include the amount of storage available within the system, routing times for water released from upstream storage reservoirs, and the inability to precisely control the amount of discharge through the turbines and spill gates. For instance, in order to achieve an approximate 0.5 foot reduction in stage at the Blountstown gage (equivalent to approximately 1,000 cfs reduction of flow), a crane must suspend the spillgate open at approximately one-half step. Releases from this operation can only be roughly estimated, and present certain safety or equipment concerns. New turbines have been installed at Jim Woodruff powerhouse that may improve the flexibility for controlling discharges at certain flows, but ratings for these turbines are still being established. Regardless of these limitations, step down releases of more than 1-foot per day will not occur except in emergency situations or during flood pulses.

The goal will be to provide a reduction in releases of 0.5 foot per day (but not less than 1.0 foot per day) when releases exceed the capacity of the powerhouse (approximately 18,000 cfs or greater). When releases are within the capacity of the powerhouse but greater than 9,000 cfs, then any reductions in releases will be made at the rate of 0.25 to 0.5 foot per day, with the goal to meet the 0.25 foot rate as flows approach 9,000 cfs. This rate of gradual reductions has been employed in previous years, with releases usually maintained for around 1 week between the next gradual reduction in releases. A flow of 9,000 cfs provides for approximately 0.5 foot of water above the highest stage at which mussel occur (8,000 cfs). Therefore, no mussels should be exposed by these reductions in flow, and other fish should be able to avoid stranding at these gradual step down rates. When releases are within the capacity of the powerhouse but less than or equal to 9,000 cfs, then attempts will be made to reduce releases at the rate of 0.25 foot per day or less. Rates of 0.25 foot per day are potentially achievable for powerhouse operations (reductions in flow of 500 cfs provide an approximate 0.25 foot reduction in stage). It is uncertain whether rates of less than 0.25 foot per day can be achieved. Previous operations have resulted in reductions in releases at the rate of 0.25 to 0.5 foot per day during sustained low flow periods. These rates appear to be within the tolerance of the two mussel species' ability to move to lower stages, as demonstrated by the presence of mussels between 8,000 cfs and 5,000 cfs levels following several years of drought conditions (1998 – 2002), during which flows approximating 5000 cfs were experienced for extended periods of time. Fall rates of 0.25 foot per day or less would provide several days for mussels to move to lower bed elevations, especially when there are several days to a week between each incremental reduction in flow.

Mobile District will continue to adhere to the 5,000 cfs minimum release from Jim Woodruff Dam, consistent with existing project operations under the 1989 draft ACF water control plan. However, comparison of the low flow mussel study data to flow/elevation data indicate that a significant percentage of listed mussel species occur at substrate depths that may be exposed by flows between 5,000 cfs and 7,000 cfs. Only a few mussels would be affected by flows between 7,000 cfs and 8,000 cfs, and no listed mussels were found at substrate depths above 8,000 cfs flow. Mobile District proposes to implement the low flow operations protocol for protected mussels whenever it appears that flows on the Apalachicola are falling or predicted to fall below levels identified as necessary to fully support protected mussel species needs. (Only *A. neslerii* were addressed in the study, but the study also noted that *E. sloatianus* occur much less frequently and typically in deeper water than *A. neslerii.*) Mussels are capable of moving deeper in the substrate in lower flow conditions, provided ramping down rates are gradual enough to accommodate this movement. Therefore, a conservative assumption is that impacts to protected mussels may potentially occur whenever flows are less than 8000 cfs. Based on this assumption, and in order to conservatively protect listed mussels from declining flows during sustained low flow conditions, informal consultation discussions will be initiated with USFWS whenever the computed 3-day basin inflows indicate that releases will fall below 8000 cfs. Consultations will be conducted via telephone conferences and/or email coordination with the USFWS and the appropriate State agency representatives to collaboratively develop the appropriate water management decisions to avoid or mitigate impacts to protected mussel species. The low flow operations protocol will provide for releases to the Apalachicola River that approximate or exceed the computed 3-day average basin inflow whenever inflows are at or below 8,000 cfs. The timing and rate of any reductions in releases below 8,000 cfs will be collaboratively determined during the consultation discussions, based on current basin inflow and predicted climatic conditions. The intent will be to reduce releases as gradually as possible (a more conservative ramping rate of 0.25 foot or less per day will be implemented), and to sustain flows as long as possible above 8,000 cfs, with any gradual step down in flow taking into consideration predicted climatic conditions, and potential impact on upstream reservoir storage and the ability to continue to sustain augmentation flows for a sustained period. It is recognized that conservation of some reservoir storage is critical to the ability of the Mobile District to provide augmentation flows during sustained low flow periods or drought conditions; and that augmentation flows may be critical to protection of mussels from exposure to the air during declining basin inflows. Flows will be maintained above 5,000 cfs even if basin inflows fall below 5,000 cfs.

As noted above, Mobile District plans to operate Jim Woodruff Dam such that minimum flows will always exceed 5,000 cfs. There are no plans to reduce flows below 5,000 cfs as part of the above-described low flow operations protocols. When basin inflows are declining below 5000 cfs, Mobile District will augment flows by making releases to the Apalachicola River that equal or exceed 5,000 cfs. In the event that the 5,000 cfs minimum release can not be met due to severe and extended drought conditions, and concern that upstream reservoir storage would be significantly depleted by the continued augmentation of flow, the Mobile District will initiate formal consultation with USFWS, pursuant to Section 7 of the ESA, to determine the effect of implementing any drought contingency measure resulting in a reduction in minimum release flows below 5,000 cfs on the protected mussel species. However, it is highly unlikely dry conditions in 2006 would result in the need for such a drought contingency measure.

Operations at Jim Woodruff Dam conducted in accordance with the above-described Interim Operations will assure that in most cases low flow conditions experienced on the Apalachicola River will not be the result of a discretionary action by the Mobile District, but would be the consequence of extended low and/or declining basin inflows during extended dry or drought periods. Efforts by the Mobile District to augment flows above the basin inflow will provide mitigation for declining basin inflow and will benefit the federally protected species. However, during extended dry or drought periods, recommended operations at Jim Woodruff Dam could result in trade-offs between minimal impacts to Gulf sturgeon spawning activities or critical habitat area, or to host species life cycle needs during the spring or summer months, in order to conserve sufficient storage in upstream reservoirs to provide for future augmentation flows in the summer or fall months to protect listed mussels from exposure. Mobile District believes that adjustments to project operations and more conservative operations measures that have been employed, as developed during previous informal consultation with USFWS, provide sufficient assurance that any such trade-off impacts will be minimal and should not jeopardize the continued existence of the species.

Based on the above Interim Operations protocols proposed for implementation in 2006, and the associated more conservative avoidance and minimization measures established to protect listed species, the Mobile District has determined that operations at Jim Woodruff Dam and releases to the Apalachicola River during low flow conditions may affect but are non-jeopardizing to the federally threatened Gulf sturgeon, federally endangered fat threeridge mussel, or federally threatened purple bankclimber mussel and will not result in the destruction or adverse modification of Gulf sturgeon critical habitat. This determination is consistent with Section 7(d) of the ESA, which allows ongoing actions to continue after initiation of consultation if they do not irreversibly or irretrievably commit resources which would foreclose the development of reasonable and prudent alternatives.

We request you review the enclosed information with respect to ESA compliance and provide concurrence with our determination. Should you have any questions, comments, or recommendations, please contact Ms. Joanne Brandt at (251) 690-3260 or Mr. Brian Zettle at (251) 690-2115.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosures

LIST OF ENCLOSURES

Enclosure 19:	Memorandum for Record, Informal Consultation Telecon, 29 April 2004
Enclosure 20:	Memorandum for Record, Informal Consultation Telecon, 4 May 2004
Enclosure 21:	Memorandum for Record, Informal Consultation Telecon, 11 May 2004
Enclosure 22:	Memorandum for Record, Informal Consultation Telecon, 17 May 2004
Enclosure 23:	Memorandum for Record, Informal Consultation Telecon, 24 May 2004
Enclosure 24:	Memorandum for Record, Informal Consultation Telecon, 11 May 2005
Enclosure 25:	FWS-COE Email, Concurrence with Informal Consultation, 12 May 2005
Enclosure 26:	COE-FWS Email, Informal Consultation, 17 May 2005
Enclosure 27:	Memorandum for Record, Gulf Sturgeon Spawning Habitat Survey and Mapping, 23-23 October 2002
Enclosure 28:	Memorandum for Record, Gulf Sturgeon Spawning Habitat Survey and Mapping, 6-7 November 2003, 20-21 November 2003 and 21-22 January 2004
Enclosure 29:	Areal Extent of Gulf Sturgeon Spawning Habitat Inundated at NM 105
Enclosure 30:	FWS Sturgeon Eggs, Flow and Temperature Data, 2005
Enclosure 31:	FWS Summary of Sturgeon Spawning Monitoring Data, 10 June 2005
Enclosure 32:	Updated Mussel Depth Distribution Tables for 3,000 cfs – 12,000 cfs
Enclosure 33:	ACF Basin Inflows vs. Jim Woodruff Dam Releases, 2000 – 2005
Enclosure 34:	ACF Basin Reservoir Levels, 2000 – 2005
Enclosure 35:	Monthly Flows at Chattahoochee Gage, 1929 - 2004

Enclosure 1

Interim Operations Table

U.S Army Corps of Engineers, Mobile District
Interim Operations at Jim Woodruff Dam
and Releases to the Apalachicola River
In Support of Listed Mussels and Gulf Sturgeon

Minimum Releases

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
March - May	>= 37,400	not less than 37,400	Max. known flow of sturgeon spawning in the Apalachicola. All of rock shoal inundated by more than 4.59 ft. Majority of floodplain aquatic habitat (61%) in which mussel fish hosts may spawn is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 20,400 and < 37,400	>= 70% to 90% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases between 70% and 90% of basin inflow would still provide access for spawning to between 74% and 100% of the rock ledge habitat at NM 105.
	< 20,400	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
June - February	>= 37,400	not less than 37,400	Majority of floodplain aquatic habitat (61 %) in which mussel fish hosts may spawn and rear is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 8,000 and < 37,400	> 70% to 90% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (store some water from rain events) in order to allow some refill for future augmentation flows. Water stored during these conditions would be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
	< 8,000	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~18,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less whenever flows are less than 20,000 cfs, and less than 1.0 ft/day at flows greater than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions.
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cababilities.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS recommends the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 37,400 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a sliding percentage between 90% and 70% BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% to 90% BI release would assure that at least 74% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on other habitat or host species requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

Enclosure 2

FWS-COE letter dated April 28, 2000

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Field Office
1612 June Avenue
Panama City, FL 32405-3721

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

IN REPLY REFER TO:

1849•1999

April 28, 2000

Colonel David Norwood
District Engineer
Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Norwood:

We are writing to express our concern over the navigation window that the Mobile District is currently implementing in the Apalachicola-Chattahoochee-Flint (ACF) system. The drawdown of reservoir levels at this time is detrimental to fish spawning in the affected reservoirs, and the drawdown of river levels following the window will be detrimental to fish spawning in the river reaches downstream of the reservoirs.

By letter dated April 26, 2000, Russ Ober of the Georgia Department of Natural Resources communicated to Joanne Brandt of your staff the nature of impacts to some reservoir fisheries due to this untimely drawdown of the reservoirs. We agree with his appraisal of these impacts, but wish to note that the impacts of a navigation window at this time are not limited to reservoir fisheries only. Several sloughs in the floodplain of the Apalachicola River are now flowing that were not flowing before this window was initiated. Many fish species use these sloughs for spawning, and it is likely that eggs spawned in these sloughs in response to the increased river stage during the window will be lost when the window is over. As you know, healthy and productive sport fisheries are vital to the economies of several communities along the ACF system. It is difficult for us to imagine that this window was of such importance as to justify compromising the fisheries of several major reservoirs and over 100 miles of riverine habitat.

We would hope to avoid such environmentally damaging decisions in the future, and we are willing to assist the District in doing so. We note that the Corps' South Atlantic Division Regulation No. 1130-2-16 requires District operations personnel to "expeditiously advise State, Federal, and local fish and wildlife and environmental groups, as applicable, of any lake operation immediately prior to or during the fish spawn which could be detrimental to the spawn." Unfortunately, the Service was not consulted or even notified of the current navigation window. As we've described to your staff in our annual Fish and Wildlife Coordination Act transfer funding meetings, this office has lead for the Service among the Alabama, Florida, and Georgia field offices for programmatic ACF system issues, such as reservoir operations for the navigation project purpose.

Like you and many others, we have been awaiting an outcome from the ACF Compact negotiations that would possibly establish new procedures for the future operations of the ACF reservoirs. Lacking an ACF allocation agreement, however, does not give the Mobile District in the meantime carte blanche authority over reservoir operations. As the Department of Interior noted in its comments on the Corps' 1998 ACF Water Allocation Draft Environmental Impact Statement, the adoption of navigation windows was not preceded by analysis or public review as required by the National Environmental Policy Act and Corps regulations (ER 200-2-2, part 6c). Also, the District has not determined whether navigation windows may affect listed species, as required under Section 7(a)2 of the Endangered Species Act. The current navigation window is the first ever to occur during the month of April, which is the core of the spawning period for the threatened Gulf sturgeon. Host fish populations for listed mussels also could be affected at this time of year.

Please contact me soon to schedule a meeting for discussing the various environmental impacts of current ACF reservoir operations practices. I look forward to hearing from you. You may reach me at extension 225.

Sincerely yours,

Gail A. Carmody

Gail A. Carmody
Field Supervisor

cc: V. Fred Aiken, District Director; Rep. Barr, Marietta, GA
Pat Grise, Constituent Advocate, Senator Bob Graham's staff, Tallahassee, FL
Gary Mauldin, SAD Corps, Atlanta, GA
Russ Ober, GDNR, Albany, GA
Mike Gennings, GDNR, Social Circle, GA
Ted Hoehn, FWCC, Tallahassee, FL
Charlie Mesing, FWCC, Tallahassee, FL
Jon Hornsby, ADCNR, Montgomery, AL
Art Holbrook, LaGrange, GA
Jim Phelps, RiverKeeper, Columbus, GA

JZ/kb/c:nav_win.wpd

Enclosure 3

COE-FWS letter dated June 13, 2000

1 3 JUN 2000

Inland Environment Team
Planning and Environmental Division

Ms. Gail Carmody
U.S. Fish and Wildlife Service
1612 June Street
Panama City, Florida 32405

Dear Ms. Carmody:

I have received your letter dated April 28, 2000 requesting a meeting to discuss your concerns regarding fishery impacts resulting from our current reservoir operations in support of navigation windows on the Apalachicola-Chattahoochee-Flint (ACF) Rivers. You expressed particular concerns related to the impacts of the recent navigation window in late April and early May on fish spawning activities in upstream storage reservoirs and on the Apalachicola River.

The decision to schedule this latest navigation window was a difficult one, reached only after considering a number of competing needs for the limited water resources on the ACF system during this extended period of dry weather and low water conditions. Navigation had been suspended on the ACF system since August 1999, except for a brief navigation window in February 2000 to assist in floating critical replacement generator equipment to the Farley nuclear plant. The recent April navigation window was considered in order to take advantage of rainfall experienced in early April of this year, and to accommodate the waterway users' needs for movement of seasonal fertilizer shipments. The scheduled dates for the window also considered the impacts of low lake levels and high recreation demand periods during major lake events and upcoming holiday weekends; the need for steady or rising flows in Lake Seminole during application of the herbicide drip system; and the potential for conflict with fish spawning. The extended low water outlook made it unlikely that navigation could return to the river prior to July, unless a window could be scheduled for late April. A news release was distributed announcing the scheduled window beginning April 26 through May 5, and detailing anticipated impacts on reservoir levels due to releases to support the navigation window.

Our Standard Operating Procedure (SAM SOP 1130-2-9), implementing South Atlantic Division Regulation No. 1130-2-16, requires us to closely coordinate with State fisheries staff to monitor fish spawning activities in our reservoirs. We also attempt to modify our reservoir operations during a 3-week period timed to coincide with the peak of bass spawning activities, provided there would not be a conflict with authorized project purposes. Although this policy targets largemouth and spotted bass, it is intended to also benefit other spawning species. During most years we are able to implement fish spawning operations at our reservoirs while providing for our authorized project purposes, including navigation (such was the case in 1999). Fluctuating temperatures experienced this spring have resulted in a prolonged spawning period this year. The extended low water conditions have also impacted our ability to meet all authorized project purposes. At the time the navigation window was scheduled, peak bass spawning had concluded on Lake Seminole, was well underway at Walter F. George Lake and was anticipated to begin at West Point Lake. Once it became clear that bass spawning in Walter F. George Lake and West Point Lake would likely be affected by our scheduled window, we notified Alabama and Georgia State fisheries staff of the potential for impact. In order to provide for a seasonal navigation window, we were unable to operate specifically for fish spawning this year at Walter F. George, but were able to complete fish spawning operations at Lake Seminole and Lake Lanier, and partially support operations for fish spawning at West Point Lake.

Sustained low flows, restrictions in our water quality certification from the State of Florida, and other obstacles to effective channel maintenance have made the continuation of navigation windows critical to our ability to provide for the authorized project purpose of navigation. As you are aware, the Draft Environmental Impact Statement (EIS) for Water Allocation in the ACF basin has addressed impacts of our current operations, including navigation windows, in a programmatic fashion. It is our intent to address specific impacts of proposed allocation formulas, including development and implementation of drought management plans and amendments or revisions of water control plans, at a future date. These assessments will be fully coordinated with your agency and tiered off the Final EIS, once new operations plans consistent with an allocation formula can be defined.

It would be premature at this time to identify specific operation plans prior to the States' agreement to an allocation formula. However, I agree that it would be appropriate to meet to discuss our current project operations and ways to minimize the potential for impacts on fisheries in our reservoirs and on the Apalachicola River. We could use this opportunity to initiate related discussions regarding possible impacts on the threatened Gulf sturgeon and listed mussel species, and whether informal or formal consultation would be required. Our discussions could also assist in planning for future changes, and may identify certain adjustments to our operations that could be implemented in the interim. Therefore, I have asked Ms. Joanne Brandt of my Inland Environment Team, to contact you to coordinate an appropriate meeting time with our technical staff.

Sincerely,

J. David Norwood
Colonel, Corps of Engineers
District Engineer

Copies Furnished:

OP-GE/Jangula
OP-TN/Bradley
OP-G/Langan
OP-AC/Earnest
PM-C/Smith
PD-EI/Peck
CESAD-ET-PR/Mauldin

PD-EI/Brandt/690-3260
PD-EI/~~Peck~~/~~Eubanks~~
PD-EI/Findley
EN-HW/Burkett
OP-TR/~~Day~~
OP-TN/Bradley
OP-G/~~Langan~~
OP/Walker
PM-C/Smith
PD-E/Newburn/~~McClelland~~ ME for
OC/~~Shoemake~~
PD/Flakes
DX/~~Robbins~~
DC/Bailey
DE/Norwood

Mailed 6/13/02

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Field Office
1612 June Avenue
Panama City, FL 32405-3721

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

1849•1999

IN REPLY REFER TO:

April 28, 2000

Colonel David Norwood
District Engineer
Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Norwood:

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Please contact me soon to schedule a meeting for discussing the various environmental impacts of current ACF reservoir operations practices. I look forward to hearing from you. You may reach me at extension 225.

Sincerely yours,

Gail A. Carmody

Gail A. Carmody
Field Supervisor

cc: V. Fred Aiken, District Director; Rep. Barr, Marietta, GA
Pat Grise, Constituent Advocate, Senator Bob Graham's staff, Tallahassee, FL
Gary Mauldin, SAD Corps, Atlanta, GA
Russ Ober, GDNR, Albany, GA
Mike Gennings, GDNR, Social Circle, GA
Ted Hoehn, FWCC, Tallahassee, FL
Charlie Mesing, FWCC, Tallahassee, FL
Jon Hornsby, ADCNR, Montgomery, AL
Art Holbrook, LaGrange, GA
Jim Phelps, RiverKeeper, Columbus, GA

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Enclosure 4

FWS-COE letter dated October 12, 2000

United States Department of the Interior

U.S. Department of the Interior 1849 • 1999

FISH AND WILDLIFE SERVICE
Field Office
1612 June Avenue
Panama City, FL 32405-3721

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

IN REPLY REFER TO:

October 12, 2000

Colonel David Norwood
District Engineer
Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Norwood:

Thank you for the opportunity to meet with Major John Bailey and several other members of the Mobile District's staff on September 26 at our Panama City office. Representatives from the Florida Fish and Wildlife Conservation Commission (FWC) and the Georgia Department of Natural Resources Wildlife Resources Division (GDNR) attended as well, and I believe our discussion was productive. The Alabama Department of Conservation and Natural Resources Game and Fish Division was invited as well, but could not attend. By letter dated April 28, 2000, the U.S. Fish and Wildlife Service (Service) requested this meeting to discuss the environmental impacts of Federal reservoir operations in the Apalachicola-Chattahoochee-Flint (ACF) Basin. I am writing now to summarize the conclusions and commitments that we made at the meeting.

Most of our conversation focused on the practice of reservoir operations known as navigation windows, and on operations generally during periods of drought and low flow. We reviewed the impacts of the navigation window that occurred in April/May of this year -- in particular, the loss of threadfin shad spawning in Walter F. George reservoir, and the extensive failure of a sunfish (several species of the genus *Lepomis*) spawning effort on the Apalachicola River. District staff informed us that the Corps' South Atlantic Division (SAD) was revising the procedures governing reservoir level fluctuations during the spring to protect fish spawning. The Service, Florida, and Georgia all indicated an interest in having input to those revisions.

We discussed the possibility of the District providing a brief navigation window in November or December of this year in order for the Farley Nuclear Power Plant to receive new equipment via barge. Florida's representatives stated that their agency was opposed to any further use of navigation windows or other operations that result in an unnaturally high fall rate (drop in stage per unit time) on the Apalachicola River. The April/May navigation window this year concluded with a fall rate of about 1.0 feet per day for several days. Florida said that they were in the process of studying historic gage records for the purpose of recommending a maximum fall rate for the river, but that a fall rate of 1.0 feet per day was too rapid. District staff suggested that navigation windows would be uncommon in the future, because providing navigable depths under current channel and regulatory conditions required too much water from reservoir storage. We also discussed the overall wisdom of a winter window if the drought persists into next year.

To address the issues of navigation windows, operations during drought, etc., the Service urged the Mobile District to begin revising its Water Control Plan for the ACF in advance or in the absence of an agreement between the states on a water allocation formula. To leave this unique system without an up-to-date water control plan another decade would be unacceptable. Major Bailey responded that such a decision would be a question to refer to higher levels of authority within the Corps, but that the District would not be opposed to initiating a new Water Control Plan.

We concluded the meeting with some specific commitments to further coordination on ACF operational issues in the near future:

- The Mobile District would formally notify the various fish and wildlife conservation agencies of the possibility for a November/December navigation window as soon as practicable.

- The FWC would share its analysis and recommendations regarding fall rates on the Apalachicola River.

- The Service would write a letter to the SAD offering to provide technical assistance on the proposed revisions to the guidance on reservoir operations.

We again thank you for the District's responsiveness to our request for a meeting. We look forward to working closely with the District in the future on the fish and wildlife issues related to reservoir operations in the ACF.

Sincerely yours,

for Gail A. Carmody
Project Leader

cc: Joanne Brandt, Mobile District COE, AL
Gary Mauldin, SAD Corps, Atlanta, GA
Ted Hoehn, FWCC, Tallahassee, FL
Charlie Mesing, FWCC, Midway, FL
Russ Ober, GDNR, Albany, GA
Jon Hornsby, ADCNR, Montgomery, AL
Sandy Tucker, FWS, Athens, GA
Larry Goldman, FWS, Daphne, AL

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Enclosure 5

FWS-COE letter dated August 10, 2000

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Field Office
1612 June Avenue
Panama City, FL 32405-3721

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

U.S. Department of the Interior 1849•1999

IN REPLY REFER TO:

DY K
crf PD-EI
SIR

August 10, 2000

Colonel David Norwood
District Engineer
Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Norwood:

The Service is responding to two e-mail messages from Ed Burkett of your staff, dated July 27, 2000, and August 4, 2000, regarding the Corps' operation of the Apalachicola-Chattahoochee-Flint (ACF) system of federal reservoirs during the present drought. These messages announce a meeting to discuss ACF project operations on August 15 in Columbus, Georgia. The Service will send representatives to that meeting. The Corps is considering reducing releases from the ACF reservoirs to discharges less than 5,000 cubic feet per second (cfs) from Jim Woodruff Lock and Dam (JWLD), which is the minimum discharge from the system under the Corps' current ACF Water Control Plan. The purpose of this letter is to inform you in advance of the August 15 meeting that, depending on the magnitude and duration of any reduction in releases from JWLD below 5,000 cfs, such an action may adversely affect two species of freshwater mussels protected under the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq.) (the Act): the fat threeridge (*Amblema neisleri*) and the purple bankclimber (*Elliptoideus sloatianus*). We are aware of at least two floodplain streams of the Apalachicola River where these two species occur and that will likely go dry if JWLD releases drop substantially below 5,000 cfs, but the impacts to listed species would not necessarily be limited to these two streams.

A Service biologist (Jerry Ziewitz) visited several floodplain streams of the Apalachicola River between river mile (rm) 42 and rm 26 on August 2. Many floodplain streams in this reach are disconnected from the main channel at the current releases of about 5,000 cfs, and the beds of these streams are either entirely dewatered or contain isolated pools with dissolved oxygen contents less than 2 parts per thousand. Swift Slough, a distributary that flows from the main channel at rm 40.3, was still connected and flowing on August 2. Swift Slough flows into River Styx, a floodplain tributary that flows into the main channel at rm 35.3. The depth of the thalweg was 0.85 ft at the head of Swift Slough, but most of the wetted channel cross section was about 0.5 ft deep. At present, Swift Slough appears to be the principal source of flow to

River Styx. Both of these streams appeared to have a relatively abundant and diverse mussel fauna.

To identify the mussels observed at Swift Slough and River Styx, Mr. Ziewitz returned the following day, August 3, accompanied by malacologist Dr. James Williams of the U.S. Geological Survey, three of his staff, and two biologists of the Corps' Mobile District staff (Joanne Brandt and Beverley Stout). They found 17 fat threeridge in the upstream-most 100 meters of Swift Slough. Some individuals were 2 to 3 years old, indicating that successful reproduction had occurred in this system in the months preceding the onset of the present drought. They found the shells only of fat threeridge and purple bankclimbers in River Styx, but it is highly likely that live individuals of these two listed species occur in this stream as well. In addition to the two listed species, these two streams support at least ten other species of native mussels, with several species present in large numbers. River Styx appeared also to support good habitat conditions for a variety of fish species. The species observed in the relatively clear water included redbreast sunfish over spawning beds, largemouth bass, spotted sucker, longnose gar, and several minnow and shiner species.

Lowering the river stage by more than about 0.5 ft in the vicinity of Swift Slough, relative to the Blountstown gage height of 0.51 ft on August 2, would cut off almost all of the flow into this distributary. Lowering the stage by more than 0.85 ft would entirely disconnect Swift Slough from the main channel, creating isolated pool conditions for about 3 miles downstream, and possibly also in about 1.5 miles of the River Styx. We would expect some mortality of the listed mussels species in this system, and other species, with a 0.5 ft drop, and very likely complete mortality with a drop of more than 0.85 ft, again relative to a Blountstown gage height of 0.51 ft. Such mortality has occurred already in other distributary streams that have been disconnected for extended periods during the past 2 years. For example, on August 2, we found shell material of both fat threeridge and purple bankclimber in the dry stream beds of two unnamed streams that flow from the Apalachicola River to Douglas Slough between rm 30.0 and 30.3. These streams are disconnected from the river at JWLD releases less than about 6,000 cfs.

The Corps has not as yet announced a proposed action to reduce the 5,000 cfs minimum release from JWLD, only that it is "probably prudent to consider reducing this flow." It is apparent to us that releases of less than 5,000 cfs from JWLD may adversely affect listed species; therefore, if such action is actually proposed for implementation, the Service requests that the Corps initiate formal consultation as required under 50 CFR §402.14. By this letter, the Service is providing written explanation of the basis for our request. To initiate formal consultation, the Corps would submit a written request to the Service including:

(1) A description of the action to be considered;

(2) A description of the specific area that may be affected by the action;

(3) A description of any listed species or critical habitat that may be affected by the action;

(4) A description of the manner in which the action may affect any listed species or critical habitat and an analysis of any cumulative effects;

(5) Relevant reports, including any environmental impact statement, environmental assessment, alternative analysis, or biological assessment prepared; and

(6) Any other relevant available information on the action, the affected listed species, or critical habitat (50 CFR §402.14(c)).

The formal consultation process does not begin until the Service receives the information listed above, or a statement explaining why that information cannot be made available. We would notify you when we received all of the necessary information; our notification letter would also outline the dates within which formal consultation should be completed and the biological opinion delivered on the proposed action.

We remind the Corps that after the initiation of consultation, a Federal agency shall make no irreversible or irretrievable commitment of resources with respect to the agency action which has the effect of foreclosing the formulation or implementation of any reasonable and prudent alternatives which would avoid violating Section 7(a)(2) of the Act (50 CFR §402.09).

If you have any questions about this letter, please call me at 850-769-0552 ext 225.

Sincerely yours,

Gail A. Carmody

Gail A. Carmody
Project Leader

cc:
Joanne Brandt, Mobile District
Alan Egbert, FWCC, Tallahassee, FL
Charlie Mesing, FWCC, Midway, FL
Doug Barr, NWFWMD, Havana, FL
David Struhs, FDEP, Tallahassee, FL
David Waller, GA DNR, Social Circle, GA

jz/mm/acf_ops.wpd

Enclosure 6

COE-FWS letter dated November 17, 2000

1 7 NOV 2000

Inland Environment Team
Planning and Environmental Division

Ms. Gail Carmody
Project Leader
U.S. Fish and Wildlife Service
1612 June Avenue
Panama City, Florida 32405-3721

Dear Ms. Carmody:

Thank you for your letter dated August 10, 2000 (copy enclosed) requesting the U.S. Army Corps of Engineers, Mobile District to initiate formal Section 7 consultation prior to the implementation of a possible drought contingency action for the Apalachicola-Chattahoochee-Flint (ACF) River Basin. This possible action was discussed at a drought meeting held in Columbus, Georgia on August 16, 2000. Due to the extended drought conditions within the ACF River Basin, the contribution of natural flows from the Flint River has been drastically reduced. In order to meet the requirement for a minimum 5000 cfs release from the Jim Woodruff Dam to the Apalachicola River, we had been providing substantial releases from our upstream storage reservoirs (Lake Lanier, West Point Lake and Walter F. George Lake). The requirement for this minimum release is contained in our current ACF water control plan. This minimum release has provided an augmentation of approximately 2000 cfs to 3000 cfs flow on the Apalachicola River above the natural inflows to the system. The continued drain of storage from the upstream reservoirs to meet the minimum releases to the Apalachicola River raised concern that storage could be depleted and/or reservoirs would not be able to refill. These conditions could aggravate or prolong drought impacts or possibly impose future limitations on water supply or other project purposes. The possible drought contingency ~~plan~~ action presented at our drought meeting would incrementally reduce the amount of releases from the Jim Woodruff Dam based on natural inflows and the status of storage in our headwater reservoirs, in order to preserve reservoir storage and prolong our ability to continue to augment flows on the Apalachicola River. Such a reduction in minimum releases would have required approval of a variance from our ACF water control plan.

Your letter advised that any reduction of releases to the Apalachicola River below 5000 cfs could potentially adversely affect two Federally listed freshwater mussel species protected under the Endangered Species Act of 1973 (ESA): the fat three-ridge (*Amblema neislerii*, Endangered) and the purple bankclimber (*Elliptoideus sloatianus*, Threatened). You also identified several habitat areas supporting these two protected species that could be dewatered or isolated by flows on the river less than 5000 cfs. Section 7 of the ESA requires a Federal agency to initiate formal consultation with the USFWS whenever a Federal action would adversely affect a Federally listed species. Formal consultation would normally require a minimum of four months to complete, although expedited procedures could be followed in emergency cases.

Since August, the Mobile District has initiated discussions and preliminary field data collection in partnership with Jerry Ziewitz of your office and Jim Williams of the U.S. Geological Survey, Biological Resources Division (USGS-BRD). A field reconnaissance survey was conducted on September 20-21, to identify those areas requiring additional assessment and/or additional data needs. We are currently preparing a draft scope of work (SOW) for additional field assessments to be conducted by Dr. Drew Miller of the Corps' Waterways Experiment Station, Engineer Research and Development Center (WES-ERDC). This draft SOW will be further coordinated with your office. We are also continuing informal consultation with USFWS and USGS-BRD to gather information necessary to prepare a biological assessment addressing potential impacts to the mussel species. In the event drought conditions continue and it is determined necessary to proceed with a request for a variance from the 5000 cfs minimum release, we would submit a biological assessment of impact to the listed species and initiate Section 7 consultation pursuant to the requirements of the ESA. The impacts of the proposed variance from the ACF water control plan would also be discussed in an environmental assessment document pursuant to the requirements of the National Environmental Policy Act.

Due to minimal rainfall in the basin there has been some improvement in reservoir storage and the low flow on the Flint River has stabilized at near 2000 cfs. We are hopeful that there will be sufficient rainfall over the upcoming winter and spring months to allow us to meet the minimum flow requirement indefinitely until drought conditions abate. Therefore, we are not pursuing a variance from our ACF water control plan at this time. (Incidentally, if the flow reduction proposal described at our August meeting were to have been in place, it would not yet have dictated a reduction in releases from Jim Woodruff Dam below 5000 cfs.) However, we will continue to monitor drought conditions in the basin. If refilling of headwater reservoirs does not progress this winter as anticipated, we will initiate formal Section 7 consultation next spring in order to address endangered species considerations in preparation for necessary water management actions in the summer and fall of 2001.

We intend to continue to work with your agency and others to assure that we can continue to manage the scarce water resources during this drought period. Our challenge is to meet the multiple and often conflicting project purposes of the ACF river basin, while still protecting the significant aquatic resources within the basin. Thank you again for your assistance during this difficult time.

Sincerely,

J. David Norwood
Colonel, Corps of Engineers
District Engineer

Enclosure

Copies Furnished:

Florida Fish and Wildlife Conservation Commission, Tallahassee, FL/Hoehn
USGS-BRD, Gainesville, FL/Williams
WES-ERDC, Vicksburg, MS/Miller
PD-EI/Peck/Stout
EN-HW/Burkett
OP-T/Bradley
OP-TR/Day
OP-GE/Jangula
OP-AC/Earnest
OP-AC-LS/Brusse
OP-WP/Sosebee
OP-SL/Topper
CDSAD-ET-P/Mauldin

out
PD-EI/~~Brandt~~/344-690-3260
PD-EI/~~Peck~~ BP
PD-EI/~~Findley~~
PD-E/Newburn
PD-E/McClellan
EN-HW/Vaughan
EN-HW/Burkett
OP-TR/Day
OP-~~T/Bradley~~
OP-G/Langan
OP/~~Walker/Fuller~~
OC/~~Shoemake~~
PD/Flakes
DX/~~Robbins~~
DC/Bailey
DE/Norwood
PD-F/Burke

Mailed 11/20/00

Enclosure 7

COE-FWS letter dated January 18, 2006
Transmittal of Draft Low Water Mussel Study Report

Depth Distribution of the Fat Threeridge Mussel, *Amblema neislerii*, during Low Flow Stages on the Apalachicola River, Florida (6 January 2005)

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

REPLY TO
ATTENTION OF

January 18, 2006

Inland Environment Team
Planning and Environmental Division

Mr. Jerry Ziewitz
U.S Fish and Wildlife Service
1601 Balboa Avenue
Panama City, Florida 32405

Dear Mr. Ziewitz:

Enclosed for your review and comment is a copy of a draft report of a survey and study conducted by Dr. Andrew Miller of the U.S. Army Corps of Engineers, Engineering Research Development Center, entitled "Distribution of the Fat Threeridge Mussel, *Amblema neislerii*, during Low Flow Stages on the Apalachicola River, Florida (6 January 2005)." This study looked at the locations and depths of known endangered or threatened mussel populations on the Apalachicola River in relationship to several low flow conditions on the river. We initiated this study in the fall of 2000 to determine the effects of a possible drought contingency action to reduce flows below the minimum flow of 5000 cfs specified in the 1989 draft Apalachicola, Chattahoochee, Flint River (ACF) Basin water control plan. Although we never pursued the proposed reduction of the minimum flow, we agreed to complete the low water mussel study in order to address the anticipated effects of low flows in planning for future drought contingency plans. This information will also be helpful in addressing the potential for impacts to mussels during future efforts to update the existing water control plan for the ACF basin. This information will eventually be incorporated into a biological assessment of the anticipated impacts of existing water management operations on federally-listed species, pursuant to Section 7 of the Endangered Species Act of 1973.

Because we are still reviewing information in the report, any reference to information in this report should cite that it is from a draft report.

If you have any questions or wish to discuss information included in this draft report, please contact Ms. Joanne Brandt, U.S. Army Corps of Engineers, Mobile District Compliance Manager, by telephone at (251) 690-3260; or by email at joanne.u.brandt@sam.usace.army.mil.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Enclosure

DRAFT

Depth Distribution of the Fat Threeridge Mussel, *Amblema neislerii*, during Low Flow Stages on the Apalachicola River, Florida

Andrew C. Miller and Barry S. Payne

Environmental Laboratory, U.S. Army Engineer Research and Development Center, Vicksburg, Mississippi 39180-6199

Key words: endangered species, *Amblema neislerii*, mussels, Apalachicola River, Florida

6 January 2005

Abstract

A dive team was used to collect the fat threeridge mussel (*Amblema neislerii*) along transects running from shallow to deep water at moderately depositional near shore sites along the Apalachicola River, Florida, 18-20 November 2003. The purpose was to determine the depth distribution of *A. neislerii* to better evaluate effects of low water on its survival. At moderately depositional areas *A. neislerii* usually dominated, and on average comprised 35.8% of the fauna. Catch per unit effort per hour was 37.9 for all mussels and 13.6 for *A. neislerii*. These studies were completed at river stages ranging from approximately 3.5 ft to 4.5 ft, which is approximately equivalent to 9,000-11,000 cfs) on the Blountstown gage. *Amblema neislerii* was most abundant at a depth of approximately 4 ft (1.2 m) below the water surface (CPUE = 20), was common at depths of 3 ft. and 5 ft (0.9 m and 1.5 m) (CPUE = 11), and was much less common in very shallow and very deep water.

To analyze effects of extreme low water on freshwater mussels, estimates of water level elevations at discharges of 3,000 cfs (85 cms), 4,000 cfs (113 cms), 5,000 cfs (142 cms), and 6,000 cfs (170 cms) were made. These changes in elevation were used to estimate the percentage of the *A. neislerii* population that could be exposed at each study area if the discharge were to reach these reduced values. For example, it was estimated that at NM 73.3 the following percentages of *A. neislerii* would be exposed at reduced discharge: 49.1% (6,000 cfs), 53.9% (5,000 cfs), 67.9% (4,000) cfs, and 85.4% (3,000 cfs). Mussel mortality during extreme low water would be a function of duration of exposure, ambient temperature, amount of direct sunlight, and substratum type.

Introduction

Mussels of the Apalachicola River. The Apalachicola River provides habitat for an endemic freshwater mussel (Family: Unionidae) the fat threeridge, *Amblema neislerii*, which was listed as endangered on 15 April 1998. The decision to list this and 6 other mussel species in the Apalachicolan region was partially based on results of a status survey conducted at 324 sites in the Apalachicola-Chattahoochee-Flint (ACF) river basin and 77 sites along the Ochlockonee river systems, southeast Alabama, southwest Georgia, and north Florida (Federal Register 63(50): 12664-12687). The status survey was conducted by Jayne Brim Box and James D. Williams in 1991-93 using scuba, snorkeling, Plexiglas-bottomed buckets and hand-picking. Butler (1993) summarized their results for a status review of mussels of the Apalachicolan Region, and later Brim Box and Williams (2000) published their results. These and other studies were synthesized by Butler and Alam (1999) for the Technical/Agency Draft Recovery Plan, and then again for the Final Recovery Plan (Butler et al. 2003) which was signed on 19 September 2003.

Since 1996 biologists at the U.S. Army Engineer Research and Development Center (ERDC) (formerly known as the U.S. Army Engineer Waterways Experiment Station) have conducted numerous surveys for freshwater mussels (Family: Unionidae) in the Apalachicola River, using divers and waders, for the U.S. Army Engineer District, Mobile (Miller 1998, Payne and Miller 2002). Nearly 211 hours were expended searching at more than 100 sites in this 106-mile (171-km) long river. Those surveys were conducted to obtain information on the distribution and abundance of live freshwater mussels, especially *A. neislerii*, as well as a threatened mussel, the purple bank climber, *Elliptoideus sloatianus*. These surveys focused on areas proposed for use as within bank disposal areas for continued maintenance of the Apalachicola River navigation project. A few potential slough restoration sites and other potential maintenance areas were also surveyed.

Purpose of this study. The summer and fall of 1999 and 2000 in the southeast were characterized by extremely low rainfall that caused reduced flow and lowered surface water elevation in the Apalachicola River, FL. Drought conditions continued into 2001 and 2002, resulting in extended periods of times when flow conditions were as low as 5,000 cfs (142 cms), the minimum flow specified in the U.S. Army Corps of Engineers, Mobile District, current water control plan for the river basin. During the extreme drought conditions of this period, flows approached the minimum low flow of 5000 cfs for an extended period between late May and mid-November 2000. Observed inflows into the basin during the extended drought conditions in 2002 were as low as 1,000 cfs (28 cms), and storage from upstream reservoirs has been used to maintain at least the minimum flow of 5,000 cfs (142 cms) on the Apalachicola River. In the event upstream storage is not sufficient to provide the augmentation flows necessary to sustain a minimum 5,000 cfs (142 cms) discharge from Jim Woodruff Dam during future extended drought periods, a request for a variance from the 5,000 cfs (142 cms) minimum discharge in the water control plan could be requested and flows of less than 5,000 cfs (142 cms) could be experienced on the Apalachicola River. Greatly reduced water levels will negatively affect sloughs and most shallow shoreline habitats along the river and its tributaries. The major source of water for the river is discharge from Jim Woodruff Dam. Preliminary estimates have been made by the Mobile District to determine the extent of water level reduction for each 1,000 cfs (28 cms) increment of reduced discharge below 5,000 cfs (142 cms) from the dam (e.g., 4,000 cfs (113 cms) and 3,000 cfs (85 cms)). For example, at Apalachicola River Navigation Mile (NM) 35, each 1,000 cfs (28 cms) reduction in discharge could cause a decrease in surface water elevation of approximately 0.7 ft (0.2 m). Near the town of Wewahitchka, FL, there would be approximately 1.5 ft (0.5 m) decrease in elevation for every 1,000 cfs (28 cms) reduction in discharge below 5,000 cfs (142 cms).

Effects of extended periods of stage reduction could negatively affect freshwater mussels (Family: Unionidae), a resource with ecological, cultural, and economic value. Although mussels are tolerant of a certain amount of desiccation, there is no doubt that organisms stranded during low water are more likely to be eaten by predators and to be stressed or even killed by elevated air temperatures. Most backwater slough areas supporting the listed mussel species become disconnected from the main river channel at flows below 5000 cfs. This means the populations remaining in the main river channel are important to the sustainability of this species during extended drought periods. Although there are no extensive high-density mussel beds in the river, there are many moderately high-density zones in shallow areas near shore where many species, as well as one threatened and one endangered mussel species, can be collected. Reduced water levels could affect freshwater mussels in shallow areas along the main channel, as well as in backwater sloughs that normally connect to the river proper, and important mussel habitat areas in backwater sloughs and side channels could become isolated or suffer reduced inundation due to extended low river stages.

In November 2003 divers were used to collect mussels along transects running from shallow to deep water at depositional areas where *A. neislerii* was known to exist in moderate to high numbers. The purpose of this latter study was to analyze the abundance *of A. neislerii* with respect to water depth and to estimate possible effects of extreme low water on this species. *Amblema neislerii* was chosen for this analysis, rather than another listed species of concern, *E. sloatianus*, because the former species was abundant (on average about 10% of the fauna), commonly found nearshore, and distributed throughout the river. The latter species was less common (less than 2% of the fauna, typically found in deeper water, and tended to be more common in the upper reaches of the river.

Background on *A. neislerii*. Mussels have been studied sporadically in the ACF basin since the early 20th century. Van der Schalie (1940) summarized results of surveys conducted in 1915, 1916, and 1918 by multiple collectors working under the direction of Dr. Bryant Walker. Based on Van der Schalie (1940), early workers sampled 3 sites in the mainstem Chipola River and 22 sites in tributaries. The Apalachicola River was not sampled. *Amblema neislerii* was not found in tributaries and was taken only from the Chipola River; a single individual at 1 site and 16 at a second. This species comprised 1.49 % of the unionid fauna in the Chipola River, and 0.14% of the unionids at all sites in the watershed. They identified 25 species in the watershed although only 20 were from the mainstem Chipola River.

North Florida rivers were surveyed for molluscs in 1953-54 by Clench (1955) and Clench and Turner (1956). Clench and Turner (1956) reported that *A. neislerii* was rare, although when found it could be locally abundant. They considered it to be extinct in the upper Flint River where it had not been taken since the latter part of the previous century. Evidently they found live specimens in the Flint, Apalachicola, and Chipola rivers. *Amblema neislerii* was ‘amazingly abundant’ in a natural impoundment in the lower Chipola River (referred to as Dead Lake) where 10-15 *Crenodonta* (=*Amblema*) *neislerii* could be found in “every square meter” along a 200-meter reach.

In a survey conducted for the Office of Endangered Species, U.S. Department of the Interior, Heard (1975) collected mussels at 150 locations in the Gulf and Southeastern States. Three sites were in the Apalachicola and four were in the Chipola River. He provided no information on sampling methods, intensity of his efforts, or exact sample locations. He collected live *A. neislerii* only in the lower Chipola River (Dead Lake). He reported no live *A. neislerii* in the Apalachicola River although he did find shells at one of his three study sites.

Richardson and Yokley (1996) collected mussels in the lower Apalachicola River using quantitative (6-0.25 sq m total substratum removal samples) at each of 3 sites where adult *A. neislerii* or *E. sloatianus* had previously been found by individuals working for the U.S. Fish and Wildlife Service and National Biological Survey. *Amblema neislerii* was found at 1 of the 3 sites (Navigation Mile (NM) 21.8) where it comprised 25% of the assemblage. Three live organisms were less than 50 mm total shell length, and Richardson and Yokley (1996) concluded that appropriate search methods (total substratum removal) at other sites in the Apalachicola River would likely yield additional evidence of recent recruitment.

Brim Box and Williams (2000) discussed results of their 1991-92 survey in which they used timed searches to collect unionids at 324 sites in the ACF River Basin. They identified 33 species from a collection of 5,757 live individuals and 2,988 shells. The majority of collecting sites were in the Chattahoochee and Flint rivers upriver of Jim Woodruff Lock and Dam. Brim Box and Williams (2000) collected 32 live *A. neislerii* at 7 sites. Four sites had shells only; live *A. neislerii* were only found in the Apalachicola River. Butler (1993) and Butler et al. (2003) summarized those results for subsequent status reviews for *A. neislerii*.

Scientists at ERDC surveyed various portions of the Apalachicola River for the Mobile District in 1996, 1997, 1999, 2001, and 2002 (Table 2). Combining all of these data (and excluding those collected in 2003), *A. neislerii* comprised 10% of the fauna and ranked 4th of 19 species (Table 2). The most abundant species in the collection of more than 4,200 specimens was *Lampsilis teres* that comprised 35.2% of the fauna. This species, typically found in sandy substratum, comprised 36% of the fauna and was found at 57% of the sites. Overall Collection per Unit Effort (CPUE per hour) for all mussels was 21.9 and for A. *neislerii* was 2.2. *A. neislerii* was approximately 1/3 as abundant as the extremely common bivalve, *L. teres*, which is typically collected in large numbers in sandy substratum in rivers, streams, and lakes throughout the Midwest (Cummings and Mayer 1992).

Amblema neislerii also dominated the fauna at a moderately depositional site (not a disposal area) where the Chipola Cutoff joins the Apalachicola River (NM 41.7). At this location overall CPUE was 145, and *A. neislerii* was collected at the rate of nearly 90 per hour and comprised slightly more than 61% of the fauna. Total shell length for this species ranged from 12.8 to 63.7 mm and this population exhibited good evidence of recruitment.

Study Area

The Apalachicola River, formed by the confluence of the Flint and Chattahoochee rivers, originates at NM 106.3, just south of Lake Seminole in the tailwater of Jim Woodruff Lock and Dam. This 171-km (106-mile) river is the largest in Florida with a mean annual flow of 690 m^3/sec (24,367 ft^3/sec) (Light et al. 1988). The river enters the Apalachicola Bay at Apalachicola, Florida. The Apalachicola-Chattahoochee-Flint (ACF) River Basin, in Georgia and northeastern Florida, drains approximately 210,448 hectares (520,026 acres).

In 1875 the U.S. Army Corps of Engineers (USACE) was authorized to maintain a navigation channel in the Apalachicola River (U.S. Army Engineer District, Mobile 1986). In the 1950s, the modern 9-foot depth x 100-foot width (2.7 m x 30.5 m) navigation project was constructed. Dredging took place in the main channel, oxbows, tributaries, and sloughs, and dredged material was placed on the floodplain and within the natural riverbanks. Dredging is now restricted to the main channel and dredged material is primarily placed at specifically designated within bank disposal areas along the channel. In the 1980s nearly 150 disposal sites were permitted throughout the river in accordance with an approved Navigation Maintenance Plan, although in any one year only some will be used. Disposal areas are typically located on point bars, which are erosional, with the intent that seasonal high water would redistribute the deposited sediments downriver to natural accretion areas. Although maintained for commercial navigation, barge traffic in the Apalachicola River is light, having reduced from over 1 million tons per year in the 1980s to less than 300K tons in recent years due to extended low water conditions and unreliable navigation channel conditions.

In 2003 divers were used to collect mussels at 6 locations along the Apalachicola River and two locations near the entry of the Chipola Cutoff off the Apalachicola River? (Table 1, Figures 1-6). *Amblema neislerii* was known to exist in high numbers at these locations based on previous sampling. Along the Apalachicola River mussels were collected immediately downriver of Disposal Areas 65A, 66A, 63, 70, 107A, as well as a location at NM 30 near Douglas Slough. On the Chipola Cutoff two non-disposal areas were sampled for mussels, one at the entry into the Chipola Cutoff and one about 500 m downstream inside the cutoff.. During this survey searches for mussels were also made at several locations in the River Styx, Battle Bend, and Swift Slough. Although live specimens of *A. neislerii* were collected at these sites, substantial numbers were not found; therefore, these sites are not included for discussion in this report.

Methods

Mussel Surveys. Mussels were collected using a 6-person dive crew equipped with surface supplied air and communication equipment on 18-20 November 2003. During the survey period gauge height and discharge at Blountstown (NM 78) was 3.63 ft, 9,420 cfs (18 Nov 03), 4.17 ft, 10,300 cfs (19 Nov 03), and 4.94 ft 11,500 cfs (20 Nov 03). All work was done tactilely since visibility was poor. At each location 2 divers worked simultaneously, usually for 15-20 minutes. They were equipped with a pneumofathometer to record water depth and were tethered to the boat with a 100-m line. Divers worked transects from shallow to deep water, collecting mussels at 1 ft (0.3 m) increments between 2 and 9 ft (0.6 and 2. 7 m) deep. At each depth interval divers worked for 15 minutes. This provided information on catch per unit effort (CPUE), and percent species abundance at each depth increment at each sampling site. Divers communicated information on substratum conditions, water velocity, water depth, and presence of mussels to the tenders as they worked. Although every effort was made to keep divers at each depth increment, in reality they probably strayed above and below each increment. For example, samples take at the 4ft depth (1.2 m) likely included mussels living at a depth between 3.5 and 4.5 ft deep (1.1 and 1.4 m).

At the end of each collecting period all live mussels collected were returned to the boat or a station onshore. Live organisms were counted, identified, and returned to the river at a suitable location not likely to be disturbed by planned maintenance. Mussel taxonomy is consistent with Williams et al. (1993).

Low Water Elevation Predictions. The minimum flow specified in the current operating water control plan for the ACF is 5000 cfs. Incidents of releases from Jim Woodruff Dam below 5000 cfs have been rare, but did occur for 1 day during the 1981 drought, and on 48 days during the 1986-1988 drought. The lowest monthly observed flow on the Apalachicola River during the recent 1998-2002 drought occurred during June and July 2000 when discharge at Jim Woodruff Lock and Dam was about 5,000 cfs (142 cms). Historically, mean daily discharge at Jim Woodruff Lock and Dam has never been as low as 3,000 or 4,000 cfs (85 or 113 cms). Therefore, the slope of the river at 5000 cfs was used to estimate the equivalent river elevation at discharges less than 5,000 cfs (142 cms).

Using 5 continuous Apalachicola River recording gages, a low water profile was developed from observed daily stages. The steps below briefly describe methods to estimate the elevation at the locations where mussels were collected in November 2003.

1. Developed surface water profile for July 4-6, 2000.
2. Computed the surface water slope between each gage site.
3. Extended the Chattahoochee stage discharge rating to estimate the stage for 3,000 and 4,000 cfs (85 or 113 cms).
4. Using the slope from step 2 and estimated elevation from step 3, the river profile for 3,000 and 4,000 (85 or 113 cms) was estimated.
5. The elevation at the mussel collecting sites was computed using linear interpolation.

The above calculations required the following assumptions:
1. All elevations are feet above NGVD 1929.
2. The base flow is the same as during the June and July 2000 drought conditions.
3. There was no tidal effect at the most downstream gage, at Sumatra., Florida.
4. The hydraulic energy gradient was the same for all 3 flows.
5. Recording gages located at Chattahoochee, Blountstown, Wewahitchka, Mile 35 and Sumatra, FL.

Predicting Effects of Reduced Water Levels on the Mussel Fauna. CPUE was treated as a density estimate for these calculations. CPUE data at each sampling location was used to obtain the percentage present at each depth increment. The relationship between discharge and changes in elevation were related to depth distribution of mussels to provide an estimate of the percentage of *A. neislerii* that would be exposed at reduced water levels at each location. Mussel mortality cannot be estimated simply from exposure data. The effects of desiccation on mortality would be affected by various factors including 1) Size and age of the individual mussel, 2) Ambient temperature, 3) Duration of the atmospheric exposure, 4) Sediment type, and 5) sediment moisture content. This will be discussed in more detail below.

Results and Discussion

The Biotic Assemblage. The relative abundance of *A. neislerii* was high when sampling was restricted to moderately depositional sites downriver of point bars. At 7 moderate depositional sites this species ranked number 1 of 12 species and comprised 35.8% of the fauna (Table 2). CPUE was 37.9 for all mussels and 13.6 for *A. neislerii*. Sediment moisture content varied from 31.2 to 44.7%, and organic content from 1.2 to 2.7% along transects running from shallow to deep water (Figure 7). There was no significant relationship between water depth and organic or moisture content. CPUE ranged from 0.5 to 20.2 and from 6.3 to 55.9 for *A. neislerii* and all mussels respectively, along these transects. The maximum CPUE for *A. neislerii* and total mussels was at a depth of 1.2 m (4 ft) (Figure 2). Depths less than 1.2 m (4 ft) are probably more stressful for mussels because of predation and exposure during extreme low water. Moving toward the thalweg habitats becomes less suitable as sediments become more erosional. See Tables A1 and A2 in the Technical Appendix for detailed information on the sites surveyed in 2003.

Early reports on *A. neislerii* (van der Schalie 1940, Clench and Turner 1956, Heard 1975) give an impression of rarity, although by today's standards it is difficult to critically review these papers without knowing more details. An extreme example is a short paper (< 200 words) by Hyning (1925) in which he refers to this species as 'rare.' Hyning

(1925) described being given an unknown number of A. *neislerii* from the Chipola River by a fisherman.

Results of this survey conducted in 2003 indicate that *A. neislerii* is abundant in appropriate habitats in the Apalachicola River. Like its congener *Amblema plicata*, this species does best in slightly depositional zones in medium-sized to large rivers, and is less common in smaller streams and high-velocity zones. Therefore, *A. neislerii* was probably never common in the smaller Flint or Chipola Rivers, and is mainly found in moderate to high numbers in appropriate habitat in the Apalachicola River. It is endemic to the ACF basin because it has been isolated from the Mississippi drainage by marine conditions to the south and physiography to the east and north. It is likely that if earlier workers had access to power boats and a dive crew, they would likely have found this species alive and well in the Apalachicola River.

Results of surveys conducted by ERDC biologists since 1996 indicate that while *A. neislerii* is listed as endangered it can be easily collected at moderately depositional sites where it often dominates. During our survey, conducted 18-20 November 1993, this species was most abundant at a depth of 4 ft (1.2 m) and moderately abundant at 3 ft (0.9 m) and 5 ft (1.5 m) deep (Figure 8). It was much less common in water deeper than 5 ft (1.5 m) where conditions were likely too erosional. It was also much less abundant in water less than 0.9 m deep, probably because it was subjected to predation and desiccation.

Effects of Extreme Low Water on *A. neislerii*. To analyze effects of extreme low water on freshwater mussels, estimates of water level elevations at discharges of 3,000, 4,000, 5,000, and 6,000 cfs (85, 113, 142, and 170 cms) were made (Table 4). At each study site during the November survey, daily discharge was approximately 10,000 to 12,000 cfs (283 to 340 cms) (Table 4). Discharge of less than 5,000 cfs (142 cms) at Jim Woodruff Lock and Dam has rarely been recorded, but has occurred during extended severe drought periods. It was estimated that a discharge of 4,000 cfs (113 cms) could result in an elevation loss of from 4.1 to 5.4 ft (1.2 to 1.6 m), and a discharge of 3,000 cfs

(85 cms) could result in decline of 4.7 to 6.1 ft (1.4 to 1.8 m) (Table 5) below the river stages observed during the November 2003 survey (Table 5).

The percentage of *A. neislerii* along the shore that would be exposed by incremental declines in water level at each of the 2003 study areas was estimated (Table 6a). For example, it was estimated that at NM 73.3 the following portions of the *A. neislerii* assemblage would be exposed at reduced discharge: 49.1% (6,000 cfs), 53.9% (5,000 cfs), 67.9% (4,000 cfs) and 85.4% (3,000 cfs). At navigation miles 41.5, 46.8, 48.4, and 49.0 substantially more mussels would be exposed at each 1,000 cfs change in discharge (up to 100% at a discharge of 3,000 cfs). These percentage values were then used to estimate the actual number of *A. neislerii* that would be exposed (see Table A1)at each of the four discharge values (Table 6b). The estimated number of mussels exposed to the atmosphere at the four discharge values (Table 6b) was determined by multiplying the percentages for each discharge value (Table 6a) by the number of *A. neislerii* collected in one hour of sampling. For example, at NM 30 a total of 11 *A. neislerii* were collected in one hour. Therefore, at 3,000, 4,000, and 5,000 and 6,000 cfs it was estimated that 6.1, 5.2, 2.1 and 0.0 *A. neislerii* would be exposed to the atmosphere.

Just because mussels are exposed to the atmosphere does not necessarily mean they will be stressed or even killed. Mussel mortality will be a function of duration of exposure, ambient temperature, amount of direct sunlight, and substratum type. Mussels that are partially buried in cool, moist substratum would likely survive much better than those lying on top of the substratum and directly exposed to sunlight.

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Table 1. Location of samples sites searched for ***A. neislerii*, November 2003. Surveys were conducted immediately downriver of 5 Disposal Areas (DA), along the shore, near the mouth of Douglas Slough, and at 2 sites near the entry of the Chipola Cutoff off the Apalachicola River.**						
WP	**Date**	**Time**	**Longitude**	**Latitude**	**Notes**	**NM**
145	18-Nov-03	2:54:00 PM	85.11685	30.02453	Near mouth of Douglas Slough	30.0
150	19-Nov-03	9:24:00 AM	85.11959	30.1978	DA 65A	48.4
152	19-Nov-03	10:28:00 AM	85.11996	30.1978	DA 65A	48.4
153	19-Nov-03	11:32:00 AM	85.11645	30.20457	DA 66A	49.0
154	19-Nov-03	12:58:00 PM	85.09632	30.22057	DA 70	53.4*
155	19-Nov-03	2:15:00 PM	85.13486	30.18173	DA 63	46.8
156	19-Nov-03	3:42:00 PM	85.147	30.12915	Near entry into the Chipola Cutoff	41.5
157	19-Nov-03	5:09:00 PM	85.14982	30.13413	500 m inside the Chipola Cutoff	41.5
158	20-Nov-03	7:55:00 AM	85.02044	30.39815	DA 107A	73.3
159	20-Nov-03	8:59:00 AM	85.02091	30.39801	DA 107A	73.3
160	20-Nov-03	9:45:00 AM	85.02015	30.39808	DA 107A	73.3
*Note - Although mussels were found at NM 53.4, no *A. neislerii* were collected at this location						

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Table 2. Summary of timed searches for mussels at disposal areas, slough mouths, or banks requiring maintenance in the Apalachicola River Florida, 1996, 1997, 1999, 2001, and 2002.

Species	% Abundance	% Occurrence	CPUE, hr
Lampsilis teres	35.22	58.3	7.70
Glebula rotundata	23.81	46.9	5.20
Elliptio icterina	14.48	22.9	3.16
Amblema neislerii	10.00	22.9	2.19
Quincuncina infucata	2.76	22.9	0.60
Elliptio crassidens	1.64	16.7	0.36
Megalonaias nervosa	1.55	15.6	0.34
Elliptoideus sloatianus	1.69	9.4	0.37
Pyganodon grandis	1.31	19.8	0.29
Elliptio complanata	6.12	15.6	1.34
Toxolasma paulus	0.40	8.3	0.09
Utterbackia imbecillis	0.21	6.3	0.05
Villosa villosa	0.19	3.1	0.04
Pyganodon cataracta	0.16	3.1	0.04
Uniomerus caroliniana	0.12	3.1	0.03
Elliptio arctata	0.19	3.1	0.04
Utterbackia peggyae	0.07	2.1	0.02
Pyganodon heardi	0.05	2.1	0.01
Lampsilis claibornensis	0.05	2.1	0.01
Total locations	96		
Total individuals	4,268		
Total species	19		
Time, hr	195.3		
CPUE, hr	21.9		

Table 3. Summary statistics, freshwater mussels survey at moderately depositional sites in the Apalachicola River, Florida, 18-20 November 2003.

	Abundance		Occurrence		
Species	**Number**	**Percent**	**Number**	**Percent**	**CPUE**
A. neislerii	208	35.80	47	47.0	13.57
G. rotundata	188	32.36	55	55.0	12.26
L. teres	62	10.67	28	28.0	4.04
E. icterina	48	8.26	21	21.0	3.13
Q. infucata	24	4.13	14	14.0	1.57
E. complanata	16	2.75	7	7.0	1.04
P. grandis	16	2.75	9	9.0	1.04
M. nervosa	6	1.03	4	4.0	0.39
U. peggeya	5	0.86	4	4.0	0.33
T. paulis	4	0.69	4	4.0	0.26
E. crassidens	2	0.34	2	2.0	0.13
V. lienosa	2	0.34	2	2.0	0.13
Total samples		100			
Total individuals		581			
Total species		12			
Total time, min		920			
CPUE, hr		37.9			
A. neislerii, CPUE, hr		13.6			

Table 4. Observed profile (6,000 and 5,000 cfs, 170 and 142 cms) plus estimated elevations (4,000 and 3,000 cfs, 113 and 85 cms) corresponding to survey dates. See Table 1 for sample site locations and methods section for discussion of how these data were obtained. WP = waypoint, NM = Navigation Mile, and nd = no data.								
			Estimates of elevation and discharge for survey dates		Estimates, ft			
WP	**NM**	**Notes**	**Elevation, ft**	**Daily discharge at Chattahoochee, cfs**	**6,000**	**5,000**	**4,000**	**3,000**
Nd	20.3	Sumatra	nd	nd	2.2	1.8	1.1	0.5
145	30.0	Douglas Slough	6.9	9,610	3.8	3.5	2.8	2.1
Nd	35.0	Mile 35	nd	nd	4.7	4.4	3.7	3.0
156	41.5	Chipola Mouth	13.0	11,700	9.4	9.1	8.4	7.7
Nd	44.2	Wewahitchka	nd	nd	11.3	11	10.3	9.6
155	46.8	DA 63	16.2	11,700	12.5	12.2	11.5	10.8
150	48.4	DA 65A	16.9	11,700	13.3	13.0	12.3	11.6
152	48.4	DA 65A	16.9	11,700	13.3	13.0	12.3	11.6
153	49.0	DA 66A	17.2	11,700	13.6	13.3	12.6	11.9
154	53.4	DA 70	19.3	11,700	15.7	15.4	14.7	14.0
158	73.3	DA 107A	29.5	12,200	25.2	24.9	24.2	23.5
159	73.3	DA 107A	29.5	12,200	25.2	24.9	24.2	23.5
160	73.3	DA 107A	29.5	12,200	25.2	24.9	24.2	23.5
Nd	78.0	Blountstown	nd	nd	27.5	27.1	26.4	25.7
Nd	106.0	Chattahoochee	nd	nd	39.7	39.1	38.4	37.7

Table 5. Estimated water level loss (feet) at sites surveyed in November 2003 at four discharge values.

		Estimated loss in feet			
WP	**NM**	**6,000**	**5,000**	**4,000**	**3,000**
145	30.0	3.0	3.4	4.1	4.7
156	41.5	3.6	3.9	4.6	5.3
155	46.8	3.6	3.9	4.6	5.3
150	48.4	3.6	3.9	4.6	5.3
152	48.4	3.6	3.9	4.6	5.3
153	49.0	3.6	3.9	4.6	5.3
154	53.4	3.6	3.9	4.6	5.3
158	73.3	4.3	4.6	5.3	6.0
159	73.3	4.3	4.7	5.4	6.1
160	73.3	4.3	4.7	5.4	6.1

Table 6a. An estimate of the percentage of *A. neislerii* that would be exposed to the atmosphere at three locations at discharges of 3,000, 4,0000, 5,000, and 6,000 cfs, Apalachicola River, Florida, 2003.				
	Discharge, cfs			
Locations	**3,000**	**4,000**	**5,000**	**6,000**
A	55	47	19.1	0
B	100	90.1	76	61
C	85.4	67.9	53.9	49.1
Locations A, B, and C, include sites at the following Navigation Miles:				
A	30.0			
B	41.5, 46.8, 48.4, 49.0			
C	73.3			

Table 6b. An estimate of the number of *A. neislerii* that would be exposed to the atmosphere at four discharge values. The percentage exposed, from Table 6a above, was multiplied by the estimated number present (i.e., number of *A. neislerii* found per hour of collecting) in column three of this table.						
			Discharge, cfs			
Location	**NM**	**Estimated Mussels Present**	**3000**	**4000**	**5000**	**6000**
A	30.0	11.0	6.1	5.2	2.1	0.0
B	41.5	42.6	42.6	38.4	32.4	26.0
B	41.5	3.0	3.0	2.7	2.3	1.8
B	46.8	3.8	3.8	3.4	2.9	2.3
B	48.4	5.3	5.3	4.8	4.0	3.2
B	48.4	1.5	1.5	1.4	1.1	0.9
B	49.0	3.0	3.0	2.7	2.3	1.8
C	73.3	10.5	9.0	7.1	5.7	5.2
C	73.3	1.0	0.9	0.7	0.5	0.5
C	73.3	34.7	29.6	23.6	18.7	17.0

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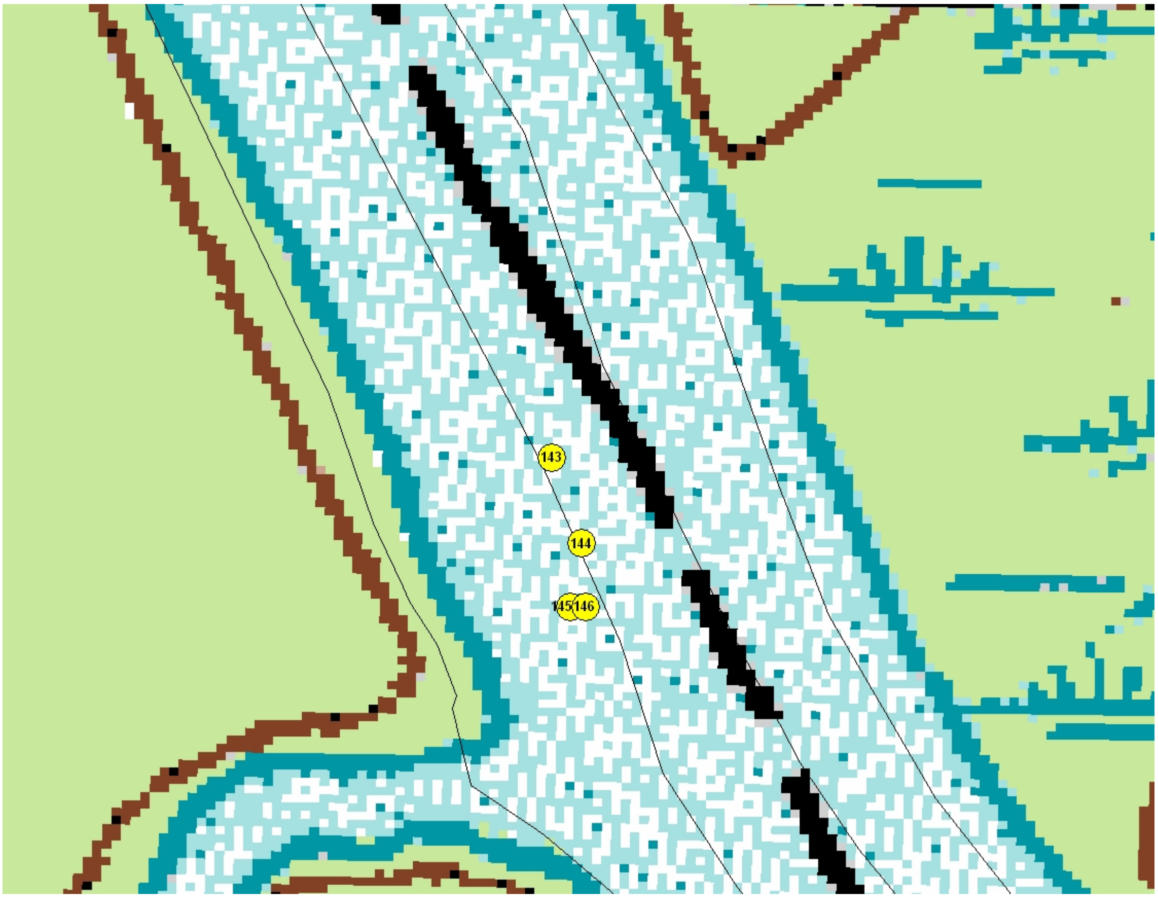

Figure 1. Mussel distribution versus depth was studied at Waypoint 145, near the mouth of Douglas Slough, near NM 30, Apalachicola River, Florida, November 2003.

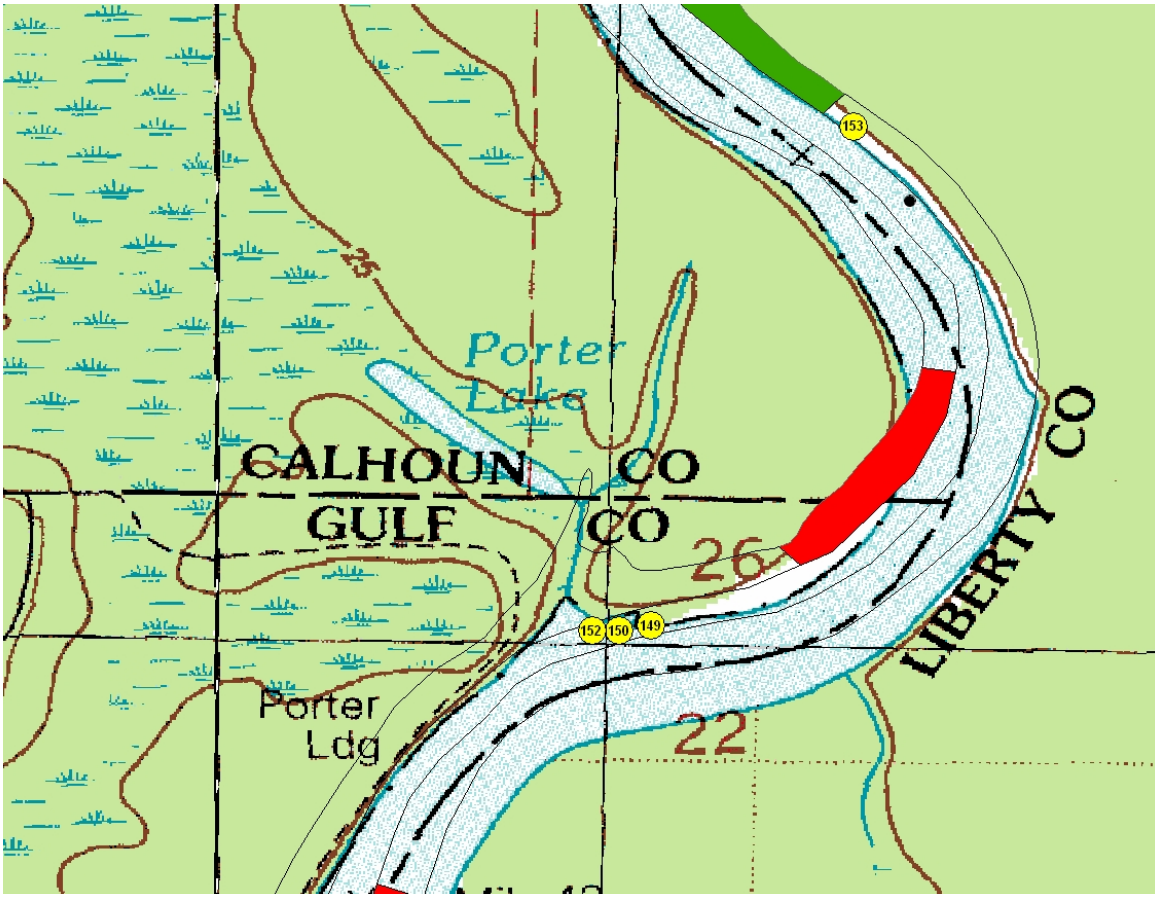

Figure 2. Mussel distribution versus depth was studied at Waypoints 150, 152, and 153, near NM 49 and Disposal Area 65A, Apalachicola River, Florida, November 2003.

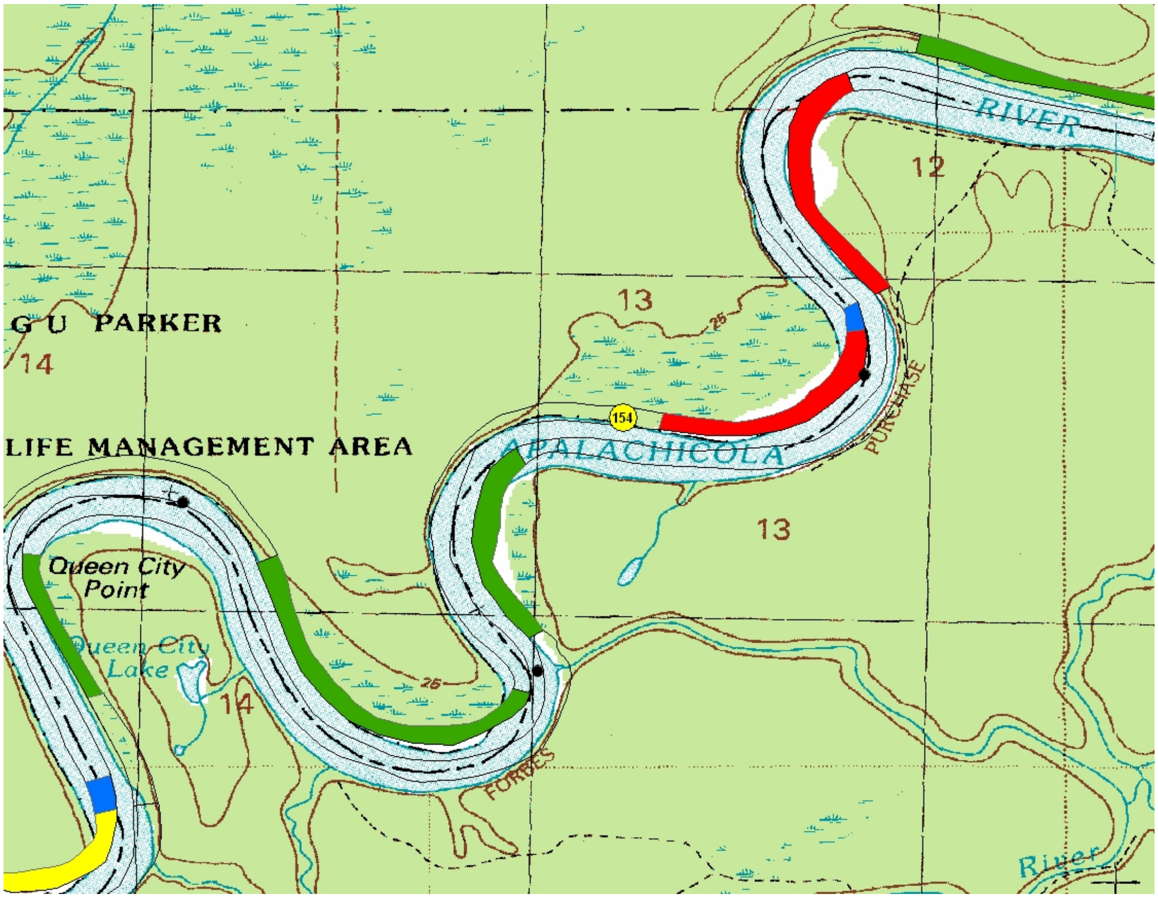

Figure 3. Mussel distribution versus depth was studied at Waypoint 154, near NM 53, Disposal Area 70, Apalachicola River, Florida, November 2003.

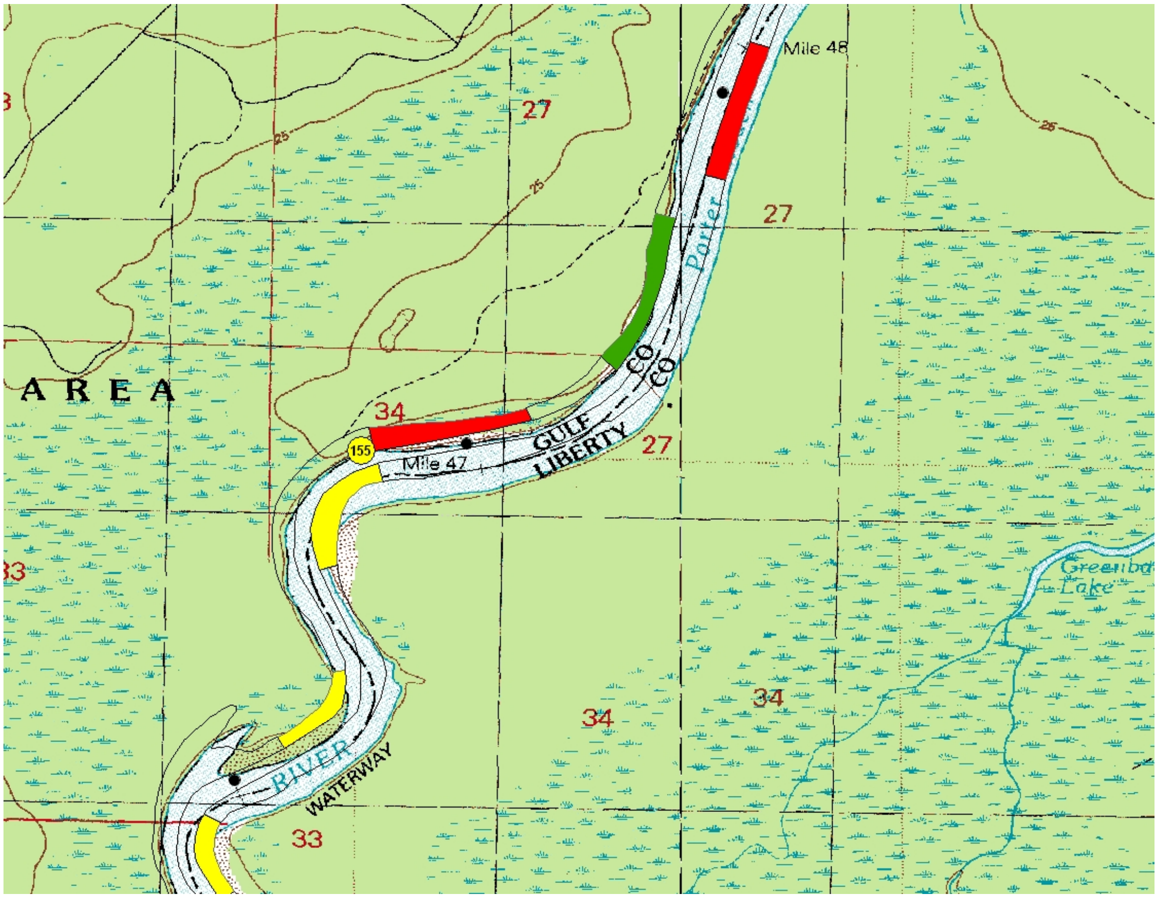

Figure 4. Mussel distribution versus depth was studied at Waypoint 155, near NM 47, Disposal Area 63, Apalachicola River, Florida, November 2003

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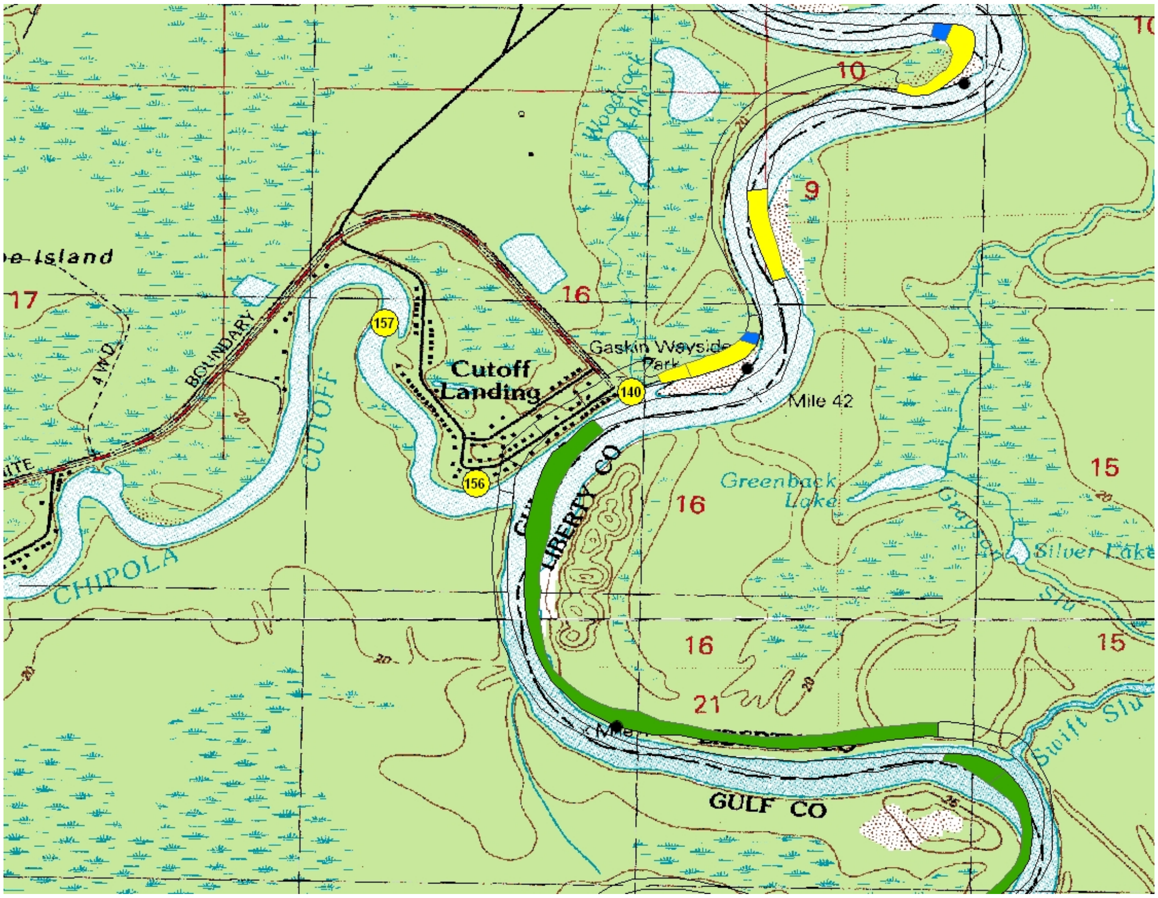

Figure 5. Mussel distribution versus depth was studied at Waypoints 156 and 157, Chipola Cutoff, Florida, November 2003.

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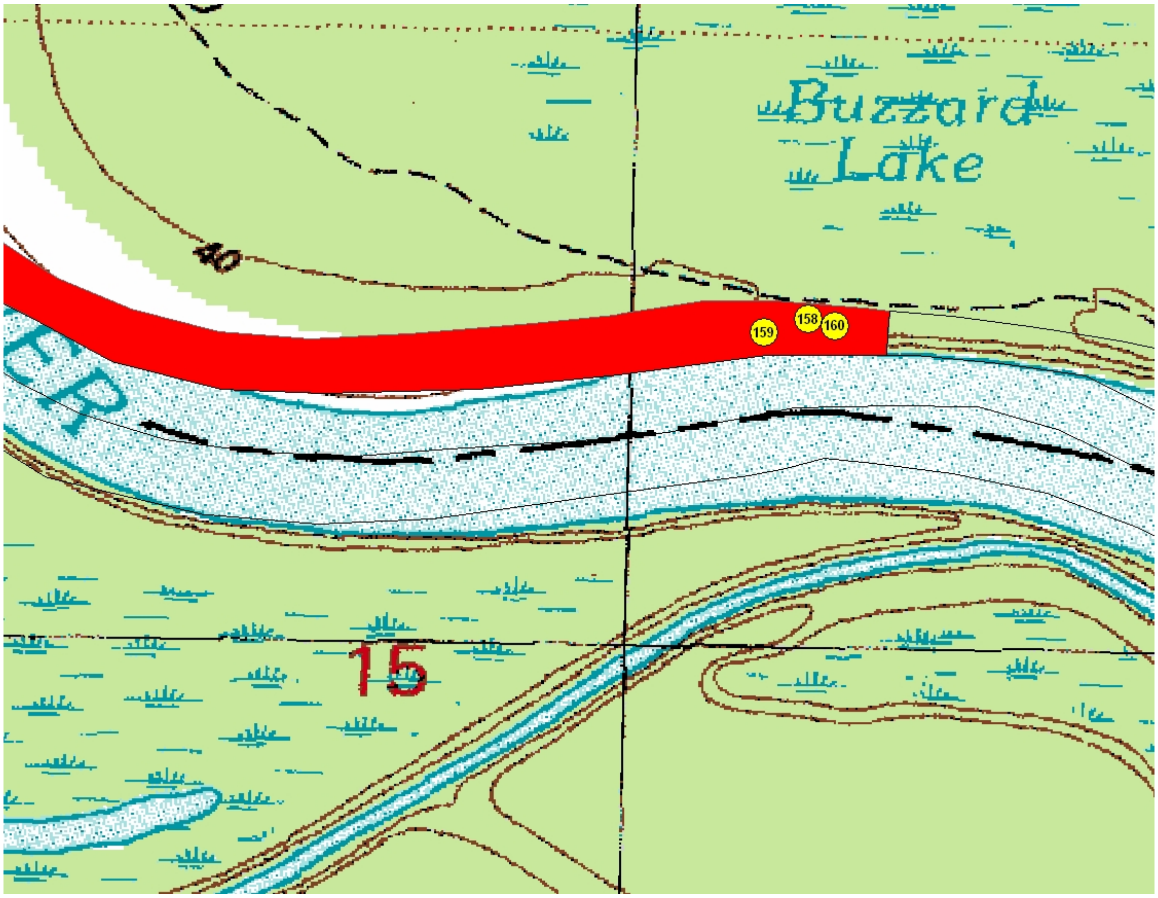


Figure 6. Mussel distribution versus depth was studied at Waypoints 158, 159, and 160, near NM 73, Disposal Area 107A, Apalachicola River, Florida, November 2003.

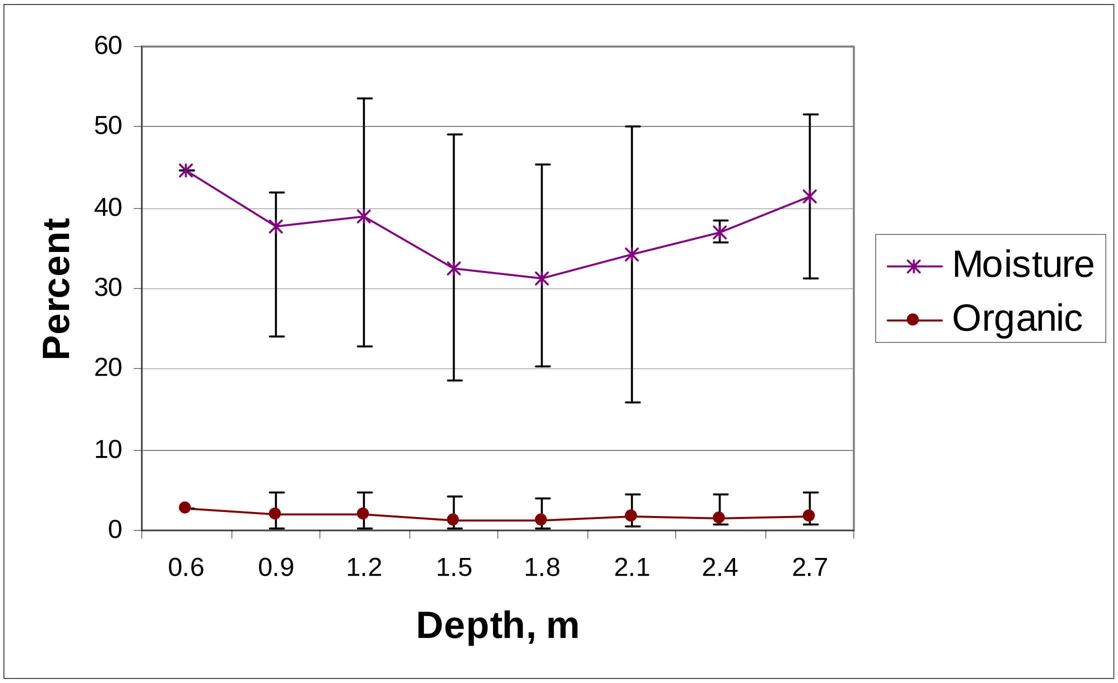


Figure 7. Moisture and organic content of sediments at moderately depositional zones in the Apalachicola River where *A. neislerii* dominated.

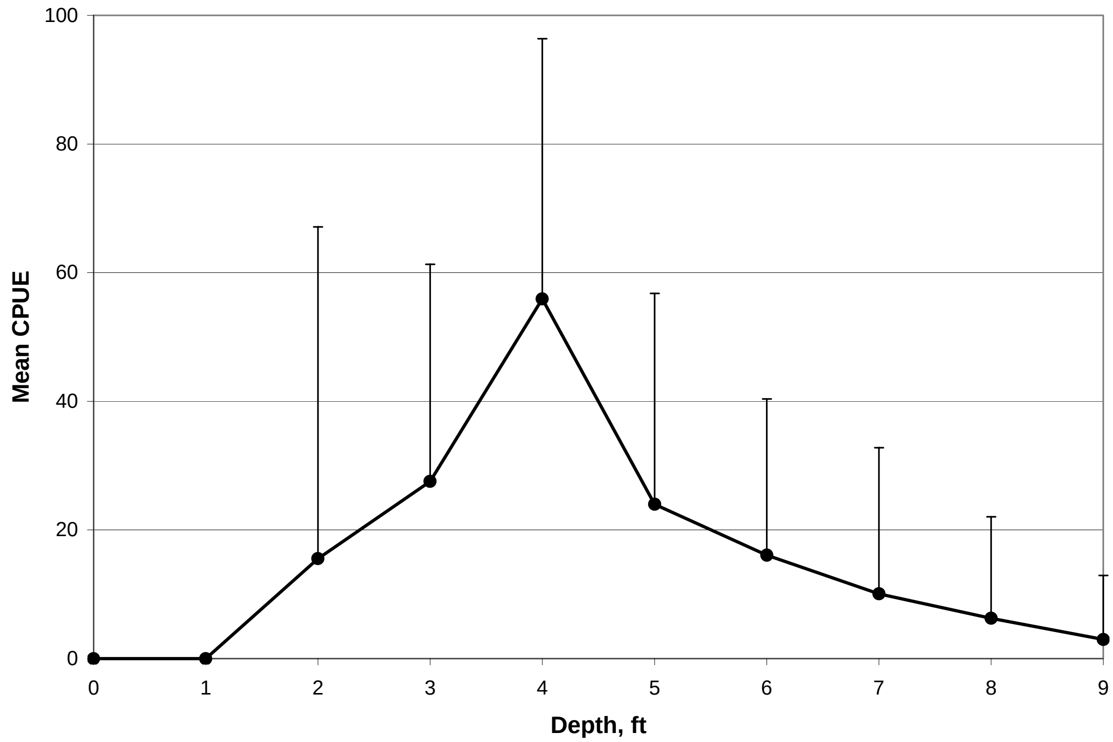


Figure 8. Distribution of CPUE versus depth for total mussels, at moderately depositional areas in the Apalachicola River, Florida, 18, 19, 20 November 2003. During the survey period gauge height and discharge at Blountstown (NM 78) was 3.63 ft, 9,420 cfs (18 Nov 03), 4.17 ft, 10,300 cfs (19 Nov 03), and 4.94 ft 11,500 cfs (20 Nov 03).

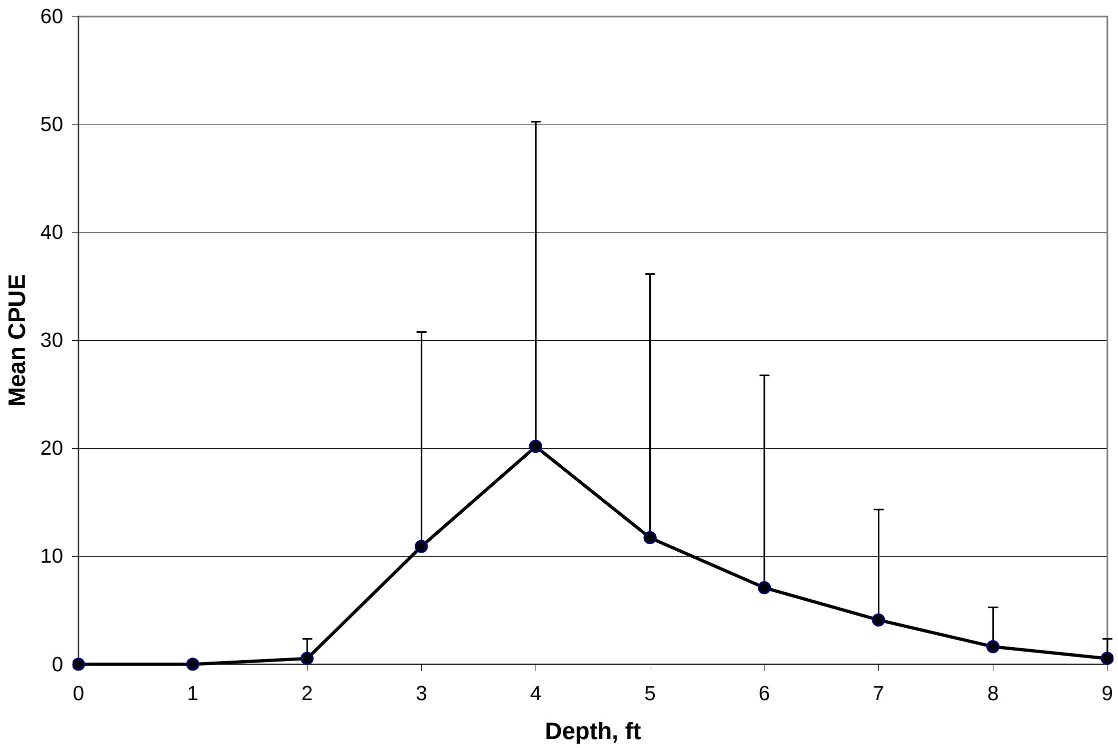


Figure 9. Distribution of CPUE versus depth for *A. neislerii* at moderately depositional areas in the Apalachicola River, Florida, 18, 19, 20 November 2003. During the survey period gauge height and discharge at Blountstown (NM 78) was 3.63 ft, 9,420 cfs (18 Nov 03), 4.17 ft, 10,300 cfs (19 Nov 03), and 4.94 ft 11,500 cfs (20 Nov 03).

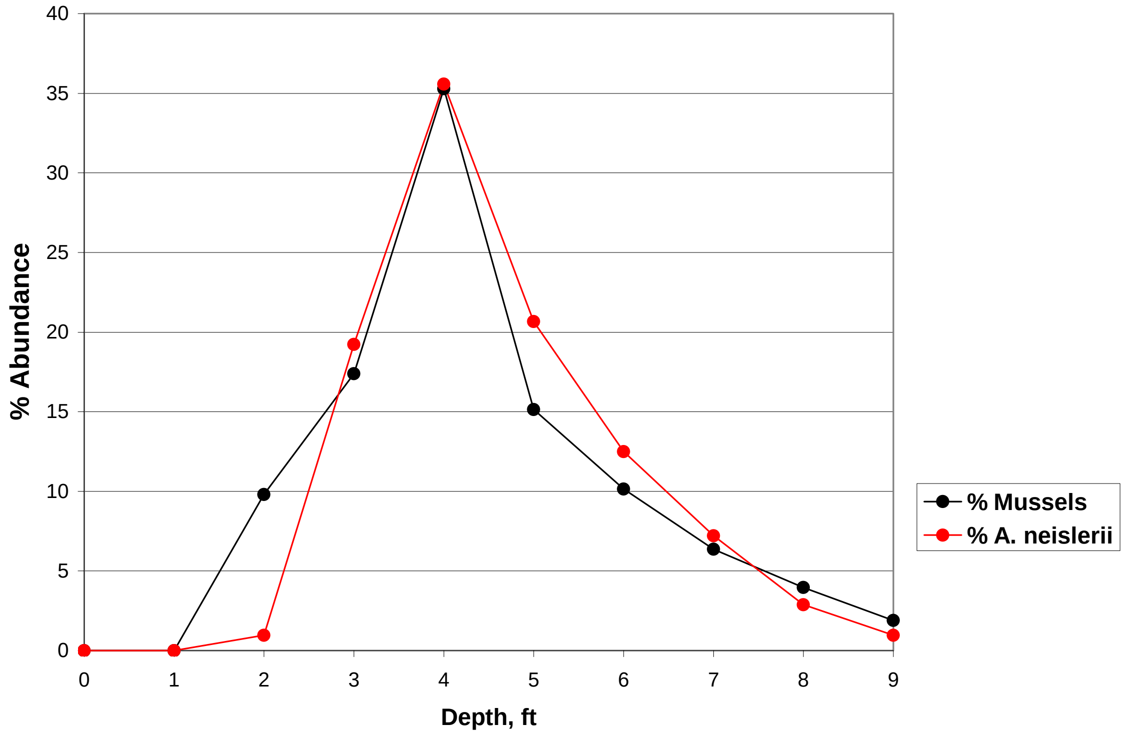


Figure 10. Percent abundance of total mussels and *A. neislerii* at selected depths at moderately depositional areas in the Apalachicola River, Florida, 18, 19, 20 November 2003. During the survey period gauge height and discharge at Blountstown (NM 78) was 3.63 ft, 9,420 cfs (18 Nov 03), 4.17 ft, 10,300 cfs (19 Nov 03), and 4.94 ft 11,500 cfs (20 Nov 03).

Enclosure 8

FWS-COE letter dated June 11, 2002

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:

June 11, 2002

Colonel Robert B. Keyser
District Engineer
Army Corps of Engineers
Mobile District
P.O. Box 2288
Mobile, Alabama 36628-0001

Dear Colonel Keyser:

Thank you for your phone call on May 7 about the operations of the Apalachicola-Chattahoochee-Flint (ACF) Basin federal reservoir projects and potential effects on the Gulf sturgeon, which is listed as a threatened species under the Endangered Species Act (ESA), during the spring spawning period this year. As we discussed on the phone, our agencies should meet soon to discuss our ESA-consultation responsibilities relative to reservoir operations, the sturgeon, and other listed species in the ACF. While both of our agencies have been preparing to do just that during the federal review process associated with a possible water allocation formula agreement under the ACF Compact, we should not delay further. The current drought is necessitating action, with or without an allocation agreement.

We have shared with your staff already our initial analyses of reservoir levels and releases this spring relative to sturgeon spawning habitat and how the federal projects might have been operated to avoid potential impacts to sturgeon spawning success (e-mail from Jerry Ziewitz of my staff to Joanne Brandt of your staff dated May 17, 2002). We hope this work may serve as a useful starting point for talking about managing instream flow during the spring spawning period for the conservation of Gulf sturgeon and other species.

The unusually low releases from Jim Woodruff Dam that occurred in April and May this year represent the most recent, but not the first, flow-related endangered species issue the Service has discussed with the Mobile District during the current drought. In the summer of 2000, we responded to a District announcement that it was considering reducing the minimum release from Jim Woodruff Dam to less than 5,000 cfs. Our letter dated August 10, 2000, (copy enclosed) noted the potential impacts of such an action to two ESA-protected species of freshwater mussels in the Apalachicola River. We advised your predecessor, Colonel Norwood, that the District would need to initiate formal consultation with the Service if the District later proposed this action.

I received my copy of the letter addressed to you dated May 16, 2002, from Florida Fish and Wildlife Conservation Commission (FWC) Assistant Executive Director Victor Heller about ACF project operations this spring. The FWC suggests a meeting between District, Service, and FWC staff to discuss reservoir operations and conservation issues. While compliance with Section 7 of the ESA is our shared federal responsibility, the issues that the FWC raise overlap so much with those we've raised that I agree a joint meeting would be useful. Similar discussions with the conservation agencies in Alabama and Georgia should also be scheduled, as management of flow in the Apalachicola River necessarily involves the Corps' Chattahoochee River projects.

I propose that our staffs meet at a time and place of mutual convenience during the week of July 8, or during the weeks of August 5 or 12. We would be glad to host this meeting at our office in Panama City. If you are agreeable, please designate a point of contact, and our staffs will coordinate a specific meeting time, location, and agenda. Jerry Ziewitz of my staff (phone extension 223, email Jerry_Ziewitz@fws.gov) is assigned to handle Apalachicola River issues, and I believe Brian Barnett is coordinating the same for the FWC.

If you have any questions about this letter, please call me at 850-769-0552 ext 225.

Sincerely yours,

for Gail A. Carmody
Project Leader

enclosure: Aug. 10, 2000 letter

cc:
Joanne Brandt, Mobile District
Kenneth D. Haddad, FWC, Tallahassee, FL
Brian Barnet, FWC, Tallahassee, FL.

jz/acf_ops4.wpd

Enclosure 9

Memorandum for Record, meeting with FWS on August 12, 2002

CESAM-PD-EI Brandt/690-3260/23 August 2002

MEMORANDUM FOR RECORD

SUBJECT: Meeting with USFWS and FWCC to Discuss ACF Water Control Operations and Consideration of Apalachicola River and Bay Aquatic Resources, 12 August 2002

1. Members of the U.S. Army Corps of Engineers, Mobile District, met in Tallahassee, Florida with representatives of the U.S. Fish and Wildlife Service (USFWS), Panama City Office, and the Florida Fish and Wildlife Conservation Commission (FWCC) to discuss specific concerns regarding water control operations on the Apalachicola-Chattahoochee-Flint River (ACF) system and impacts on fishery resources in the Apalachicola River and Apalachicola Bay. This meeting was scheduled in response to correspondence received from USFWS and FWCC raising concerns that falling river levels and extremely low flows experienced this spring had impacted potential Gulf sturgeon spawning habitat below Jim Woodruff, and also had impacted important spawning beds used by game and sport fishes on the Apalachicola River. All parties understand that the ACF basin has been experiencing sustained drought conditions since 1998 and that low flows are the result of these sustained drought conditions. However, the intent of this forum was to explore ways of improving coordination and communications related to flow management decisions and possible opportunities to minimize impacts or enhance fish spawning activities within the basin. The following agency representatives participated in the meeting discussions:

Gail Carmody, USFWS, Project Leader	850-769-0552, Ext. 225
Jerry Ziewitz, USFWS	850-769-0552, Ext. 223
Vic Heller, FWCC, Asst. Exec. Dir.	850-488-3084
Ed Moyer, Div. Dir., FWCC	850-488-0331
Ted Hoehn, FWCC, Office of Environ Services	850-488-6661
Brian Barnett, FWCC, " " "	850-488-6661
Charlie Mesing, FWCC	850-487-1645
Jim Estes, FWCC	850-488-5460
Steve Leitman, NWFWMD	850-627-3527
COL Bob Keyser, CESAM-DE	251-690-2511
LTC Joe Corrigan, CESAM-DC	251-690-2511
Curtis Flakes, Chief, CESAM-PD	251-690-2777
Joanne Brandt, CESAM-PD	251-690-3260
Memphis Vaughan, CESAM-EN-HW	251-690-2730
Gene Morisani, CESAM-EN-HW	251-690-3385
Bill Smallwood, CESAM-OP-TR	251-694-3726

A copy of the meeting agenda is attached. Also attached are handouts summarizing each agency's specific concerns regarding water control operations on the ACF.

2. USFWS Concerns.

a. It is understood that there exist potential conflicts between current reservoir management operations to keep lake levels steady during reservoir fish spawning periods, and the desire by the State of Florida to keep river levels steady during riverine fish spawning periods, often occurring concurrent with reservoir spawning activities. USFWS indicated they would gladly facilitate dialogue between the three State fishery agencies (Alabama, Florida and Georgia) and the Corps regarding any conflicting fish management concerns and recommendations for water control operations on the ACF to accommodate fish management and conservation needs.

b. Another significant concern to USFWS is the requirements of Section 7 of the Endangered Species Act to consult regarding possible impacts to Federally protected species (i.e., the threatened Gulf sturgeon, the threatened Purple bankclimber mussel, and the endangered Fat three-ridge mussel). USFWS noted there was an excellent process in place to implement consultation procedures and protective measures for the Federally listed mussels associated with the navigation dredging project. Consultation has also routinely been conducted to avoid or minimize effects on the Gulf sturgeon due to navigation dredging. Once agreement is reached on an allocation formula for the ACF basin, Section 7 consultation would be initiated to address water management actions and/or revisions to the water control plans necessary to implement the allocation formula. However, USFWS advised that the Corps not wait before initiating consultation on the existing water control operations, especially in light of new information related to possible impacts to sturgeon spawning habitat.

c. USFWS recommends that Section 7 consultation for the existing water control operations should address impacts of low flows in spring months on Gulf sturgeon spawning activities and proposed critical habitat (e.g., exposure of limerock ledges below Jim Woodruff which are likely sturgeon spawning habitat). Jerry noted that his review of historic gage data shows the top of the primary limerock ledge below Jim Woodruff had been dewatered four times in April during the past 6 years, and had never been exposed in April in previous years. The top of the rock ledge was exposed only one time in March, which occurred in 2000. He is also conducting an analysis of historic ramping down rates for both pre- and post-dam construction. Jerry estimates that flows of approximately 20K cfs would be required to inundate the entire rock ledge to a depth of 4.6 feet, which is suspected to be the minimum depth necessary to assure successful spawning behavior over hard substrate (this is the lowest depth at which sturgeon eggs have been collected on other rivers). Consultation should also address possible low flows less than 5000 cfs as a drought contingency action, and the associated impacts of dewatering or isolating essential mussel habitat.

d. USFWS recommends the Corps initiate Section 7 consultation as soon as possible with preparation of a biological assessment based on the best available information. USFWS would then prepare a biological opinion. Over the longer term, additional information could be collected or developed to refine the biological assessment and biological opinion (e.g., study on locations of mussels relative to stage; location, depth and duration of sturgeon spawning; host fish for mussel species; sturgeon nursery habitat requirements; etc.). USFWS noted that the biological opinion guidelines require them to compare the action to a baseline condition, which should take into account background drought conditions in the basin.

e. It was also recommended that the existing water control operations consultation be conducted separate from but parallel to the programmatic consultation on Gulf sturgeon to be conducted for dredging and disposal operations.

3. <u>FWCC Concerns</u>.

a. FWCC primary concern is to improve interagency communications. They are satisfied with the interagency communications regarding striped bass spawning in relation to dredging schedules, slough restoration projects, and current updates on reservoir levels and projected river stages. However, there is a need to improve coordination and communications with Florida fisheries staff regarding input into decisions on water control operations during spring spawning activities, and the ramping down of flows on the Apalachicola River in the spring and summer months.

b. FWCC would like to see conditions similar to natural flow regimes on the river. For instance, in most years they would like to see floods with stages in excess of a 15-foot Blountstown gage, which would typically occur in the February to March timeframe. Also of critical concern are durations of flows between 29K to 14K cfs since access to available adjacent floodplain habitat is reduced as river stages fall. Access to the floodplain is necessary to provide important spawning, nursery and feeding habitat for a number of sport and game species. Once the river stages fall to 14K cfs or less (approximate 6-foot Blountstown gage), then the river is essentially confined within the river banks and outside the adjacent floodplain. They also want steady river levels during fish spawn to prevent dewatering of spawning beds, and to prevent isolation or trapping of fish in pools or cutoff floodplain areas as river levels fall. FWCC noted that it was agreed during our meeting in September 2000 that the Corps would attempt to meet a goal to ramp down flows during fish spawning activities at a rate of 6 inches per day or less. FWCC concerns were that they were not consulted during fish spawn in 2002, and that ramping down of flows in April occurred at rates in excess of 1 foot per day.

c. FWCC has initiated a study of fish year classes, based on creel surveys and age distribution analyses, to document impacts due to the low flows experienced during spring of 2000, and in subsequent years. Surveys have shown the impact of reduced year classes during drought periods when low flow or other adverse conditions impact spawning success during the spring and summer months. Although fish populations can withstand occasional poor year classes due to impacts during a drought year, repeated failure to produce a healthy year class will ultimately result in significantly reduced populations.

d. Other water control concerns relating to freshwater needs for Apalachicola Bay include the need for spring flood flows important for nutrient production, followed by gradually reduced flows over the summer to fall months which result in a gradual increase in salinity in the bay. Summer freshets are also important for primary production and predator control (oyster drill). FWCC would also like opportunity to continue discussions related to water control operations to improve aquatic plant management in Lake Seminole, flow requirements for thermal refuges on the river, and spillgate operations at Jim Woodruff Dam.

e. FWCC recommends the development of formal coordination procedures, either through a memorandum or SOP, to include FWCC in the decision-making process for water control operations during fish spawn and during critical low flow periods.

4. Corps of Engineers Considerations in Water Control Operations.

a. The Corps is responsible for implementing water control operations in a manner that balances impacts and benefits for a number of authorized project purposes. Fish and wildlife conservation is recognized as one of the authorized project purposes for the ACF projects. The Corps also noted that water control operations during spring spawning months are generally a critical time for operation of the ACF system. Spawning begins at a time when storage volumes are reduced for flood control purposes during the wetter part of the year. At this time of the year, water managers must also make decisions balancing operations for flood control purposes versus the need to refill the reservoirs for the upcoming drier months. Decisions made in the spring months may impact the ability to continue to augment flows later in the season when water is in short supply. Inflows for the ACF basin in the spring months for the 3 of the past 4 years have been less than 50 percent of normal, due to the extended drought conditions in the basin. This lack of inflows has limited our flexibility to meet competing demands on the system. Rapidly dropping inflows on the Flint basin in conjunction with uncertainties in adjusting flows through a combination of the turbines and spillgates resulted in the inability to ramp down flows this spring at a rate of 6 inches or less. (The average ramping rate was closer to 1 foot per day, with rates greater than 1 foot a couple of days.)

b. The Corps summarized various system constraints and limitations that may affect the ability to release increased and/or steady flows during spring spawning months, and which may also impact the ability to meet a goal of ramping down releases at a rate of 6 inches per day or less. Structural head limits dictate release rates from Jim Woodruff Dam whenever the tailwater elevation is at or below approximate +44.5 feet (approximately 15,000 cfs flow produces a tailwater elevation of +44.5 feet), and may require immediate increases in discharge to reduce the pool elevation, increase the tailwater elevation, and reduce the head differential. Other considerations include the amount of storage available within the system, routing times for water released from upstream storage reservoirs, and the inability to precisely control the amount of discharge through the turbines and spill gates. For instance, in order to achieve an approximate 6-inch reduction in stage at the Blountstown gage (equivalent to approximately 1000 cfs reduction of flow), a crane must suspend the spillgate open at approximately one-half step. Releases from this operation can only be roughly estimated. New turbines are being installed at Jim Woodruff powerhouse that may improve the flexibility for controlling discharges at certain flows, but ratings for these turbines are still being established. It was also emphasized that forecasts of flood events or extended dry conditions may also result in reasonable and prudent decisions on whether water should be stored or released to accommodate future needs. Although the Corps is still committed to attempt to meet a goal of ramping down stages on the river at a rate of 6 inches per day, the various system limitations will likely result in rates of up to one foot per day.

c. The Corps also looked at the proposal by USFWS to enhance sturgeon spawning success below Jim Woodruff Dam to see if it could have been accomplished in the spring of 2002.. The proposal would provide for a sustained increase in flows (to approximately 22K cfs) for a two to three week period during peak sturgeon spawning in April to May, with a gradual ramp down of flows at 6 inches or less. Increasing and sustaining flows for fish spawn support, in conjunction with the gradual ramping down of flows, may be possible depending upon the specific conditions experienced in a particular year. However, head limits, impacts on lake fish spawning and available storage must also be taken into consideration. The Corps agrees that improved planning and coordination would reduce the impacts on all parties, but must also take into account a balancing of all project purposes and the uncertainty of future conditions in the basin.

d. The Corps proposed that the appropriate coordination mechanism to address the Apalachicola River fish management concerns should be the existing Mobile District Standard Operation Procedures for "Project Operations for Lake Regulation and Coordination for Fish Management Purposes" (SAM SOP 1130-2-9). Mobile is initiating an update and revision of the SOP and proposes to incorporate requirements coordination with FWCC and USFWS to include consideration of Apalachicola River fish management actions.

5. Discussion.

a. Copies of the current SOP were distributed to the meeting attendees for reference. Update of SAM SOP 1130-2-9 should be accomplished in coordination with the USFWS and fish management agencies from all three States (Alabama, Florida and Georgia). USFWS suggested that they arrange for discussion of the SOP update during the upcoming fishery management technical meeting. The meeting is currently scheduled for 24 September 2002 at the Lake Seminole resource management office in Chattahoochee, Florida, and will include representatives from each of the three States. The Corps agreed to participate in this meeting discussion on the afternoon of 24 September. The goal will be to improve 2-way communications related to water management decisions during reservoir and river fish spawning periods, and to incorporate appropriate coordination protocol and recommended fish management measures into the updated SOP.

b. It was agreed that early consultation would be conducted with the FWCC prior to initiation of river spawning activities and would continue throughout the spawning period, similar to that conducted for reservoir spawning activities. Coordination would also be initiated during other critical periods or for specific water management actions likely to significantly affect river levels. Typically communications with the State fisheries staff are initiated by or through the local project office, and then relayed to Mobile District for consideration during the weekly water management meeting (conducted on Wednesdays, at 10:30 a.m. Central Time). Feedback on water management decisions and forecasts for conditions in the basin would continue to be issued via email notices. In the event conflicts or problems are anticipated in being able to meet or maintain recommended reservoir or river levels, the weekly water meeting would include a teleconference with the state fishery POCs. Charlie Mesing was designated as the FWCC POC, with Ted Hoehn as the alternate. The Corps POC for communications with FWCC would be Don Morgan at the Lake Seminole project office.

c. USFWS suggested that the update of the SAM SOP may also represent an appropriate mechanism to initiate Section 7 consultation on impacts to Gulf sturgeon and listed mussels resulting from existing water control plan operations. It was also noted that the Corps has a certain amount of flexibility and discretion to operate under the current water control plan in order to accommodate needs for protected species and other environmental resources. Consultation could be initiated under current water control operations based upon new information regarding potential for impacts to protected species. It was suggested that we set a date in October 2002 to discuss the appropriate approach for accomplishing Section 7 consultation. It was stressed that these discussions should be conducted separately from ongoing water allocation discussions or any future discussions related to implementation of the water allocation formula. It should also be noted that additional future revisions to the SOP could be required for the future implementation of an allocation formula for the ACF basin.

d. Colonel Keyser requested technical assistance, in the form of a letter from FWCC, that would provide information on critical flows or other water management actions (minimum flows, flood pulses, etc.) determined necessary throughout the year to support Apalachicola River and Bay fish management and conservation activities. This information would assist the District in making daily water management decisions, and assure that impacts on all project purposes and uses are considered. FWCC agreed to provide their resource needs by letter prior to the 24 September technical meeting.

6. Action Items:

a. The Corps will initiate update/revision of the SAM SOP 1130-2-9 to include coordination with FWCC and consideration of Apalachicola River fish management actions. Initial discussions with the USFWS and the three state fishery agencies will begin at the 24 September technical meeting. OP, PD and EN technical staff will attend these discussions. OP-TR is responsible for updating the SOP, and staffing through District elements.

b. FWCC will identify specific water management actions requested in support of fish management activities in the Apalachicola River and Bay, and provide these to the Corps in writing prior to the 24 September meeting.

b. Corps and USFWS will meet in October 2002 to establish a strategy and approach for initiating Section 7 consultation on existing water control operations. Jerry Ziewitz and Joanne

Brandt will coordinate to set the date and agenda for this meeting. PD will be responsible for accomplishing the Section 7 consultation with USFWS.

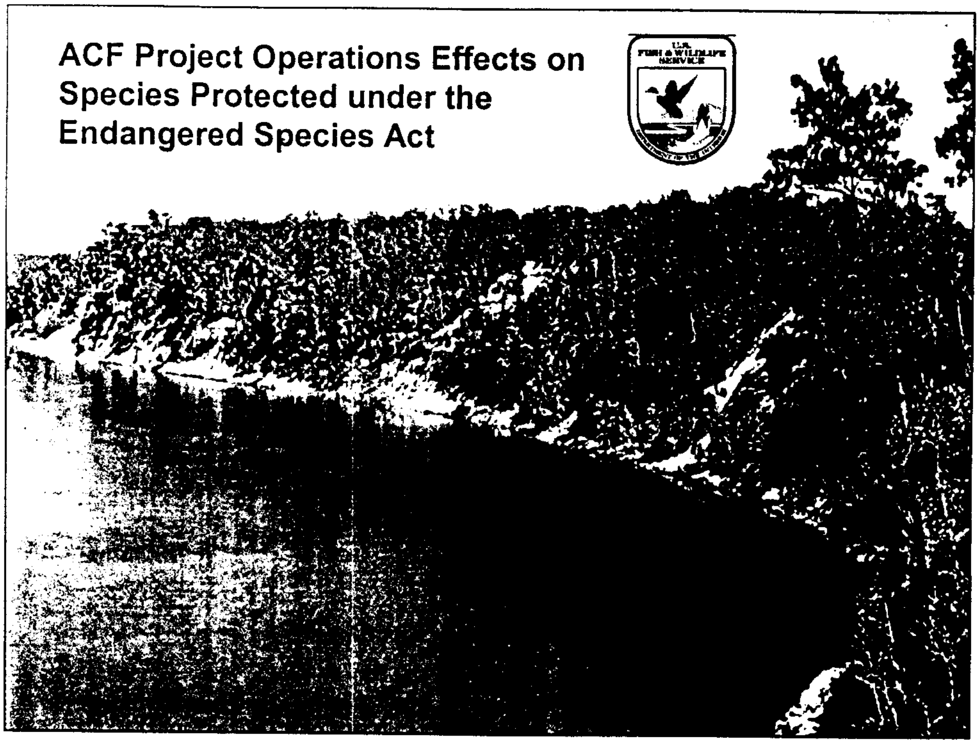
c. All parties will work to improve 2-way communications regarding Apalachicola River fish management needs and the water control operation decision-making process.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

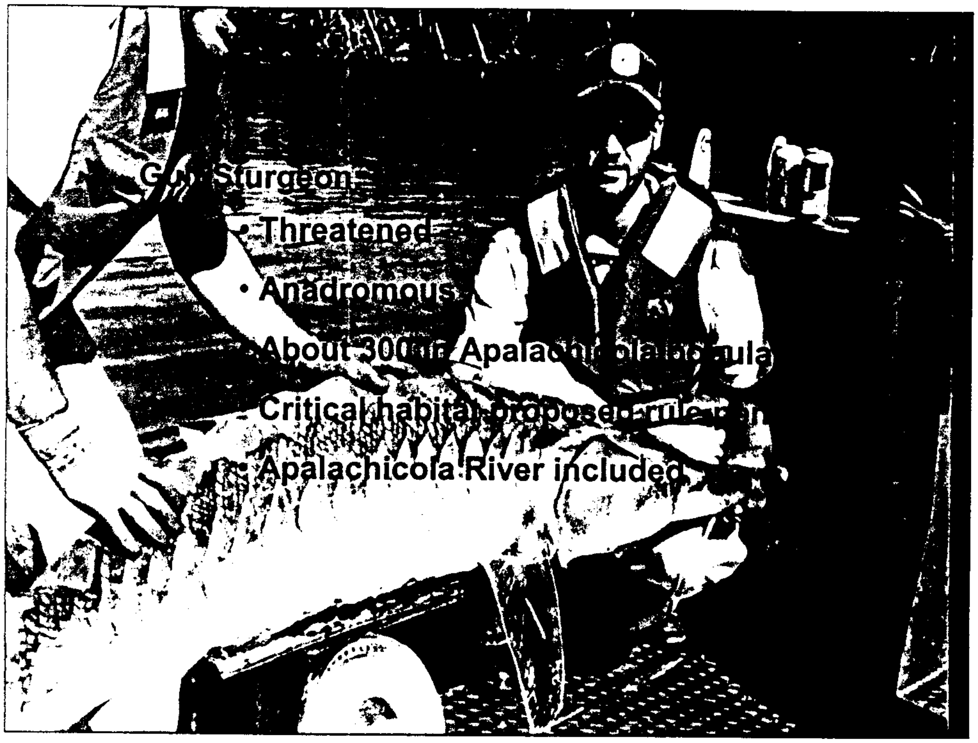
Attachments
1. Agenda
2. USFWS Presentation
3. FWCC Presentation
4. COE Presentation
5. SAM SOP 1130-2-9 (23 Feb 95)

AGENDA
ACF Water Control Operations and Consideration of Apalachicola River Aquatic Resources
12 August 2002, 1:00 p.m. EDT

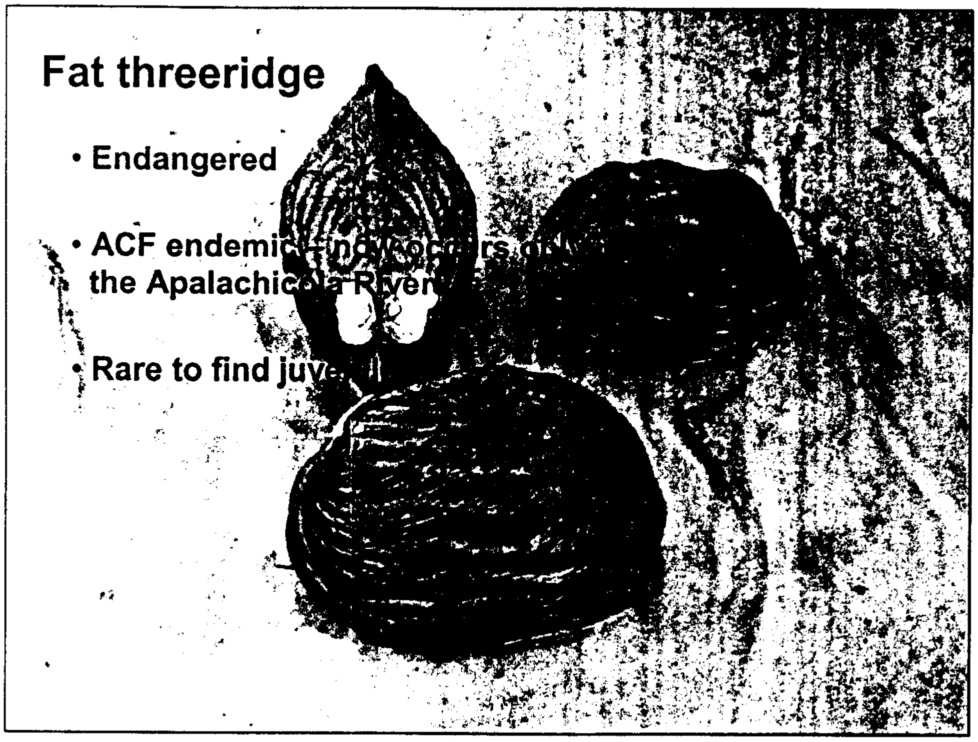
1:00 – 1:10	Introductions and Opening Remarks
1:10 – 1:30	US Fish and Wildlife Service Specific Concerns o Endangered Species Act, Section 7 Consultation Responsibilities o Gulf Sturgeon/Critical Habitat considerations o Protected Freshwater Mussels considerations o Recommended Actions
1:30 – 1:50	Florida Fish and Wildlife Conservation Commission Specific Concerns o Need for improved coordination process for Apalachicola River o Effects of past water control operations o Flow management issues on the Apalachicola River
1:50 – 2:10	Corps Considerations in Water Control Operations o Balancing of authorized project purposes o System operational limitations (physical constraints/low flow constraints) o Special operations for fish conservation management o Alternative operations for Gulf sturgeon spawning
2:10 – 3:30	BREAK
2:30 – 3:30	DISCUSSION
3:30 – 4:00	Follow-on Actions: o Meeting with USFWS and State fishery staff (AL, FL & GA) to consider coordination process and fish management measures for update/revision to SAM SOP 1130-2-9 o Team approach to consideration of alternative operations for avoiding impacts to Gulf sturgeon and listed mussels o Consider additional data needs and strategy for Section 7 consultation o Other actions?
4:00	ADJOURN



the apalach is a biological treasure, home to 91 species of fish, 27 species of freshwater mussels, and hundreds of species of other faunal groups. Of these, three are protected under the ESA. We want to talk with you today about the dams that influence the driving variable in this system, the flow regime, and how their operations may sometimes adversely affect these three species.



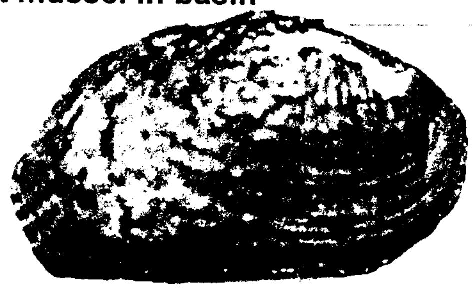
Listed as threatened in 1991. This is an anadromous fish, spends spring and summer in river. The Apalach pop was probably once among the largest and supported a commercial fishery. With overharvest and the dam, which blocks passage to historic spawning and summer resting areas, that population now numbers about 300. Under court order, we have recently issued a proposed rule designating critical habitat. The Apalach River is included in that proposal.



Listed in 1998. Occurs only on the apalach. This is one of the thicker-shelled species, and long-lived. The surveys the corps has been doing ass w nav channel maintenance has found several new locations, but it is still very rare to find juveniles. Females are gravid in the late May-Early June time frame. Several fish species may serve as hosts for the parasitic larval life stage, incl. some of the game species, a shiner, and a darter.

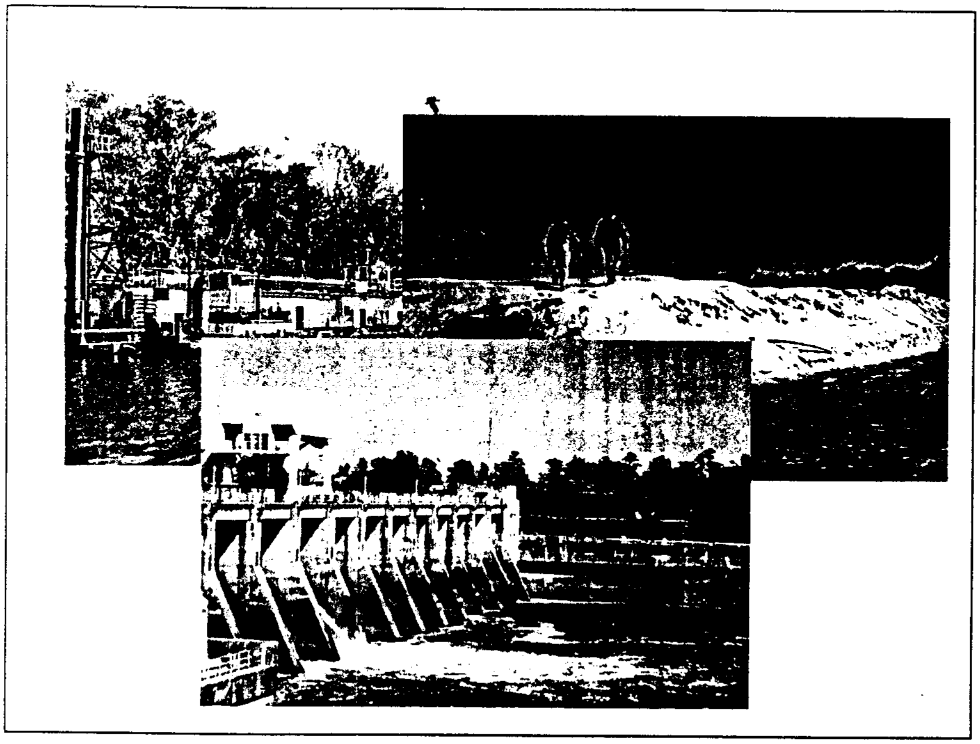
Purple bankclimber:

- **Threatened**
- **Largest mussel in basin**

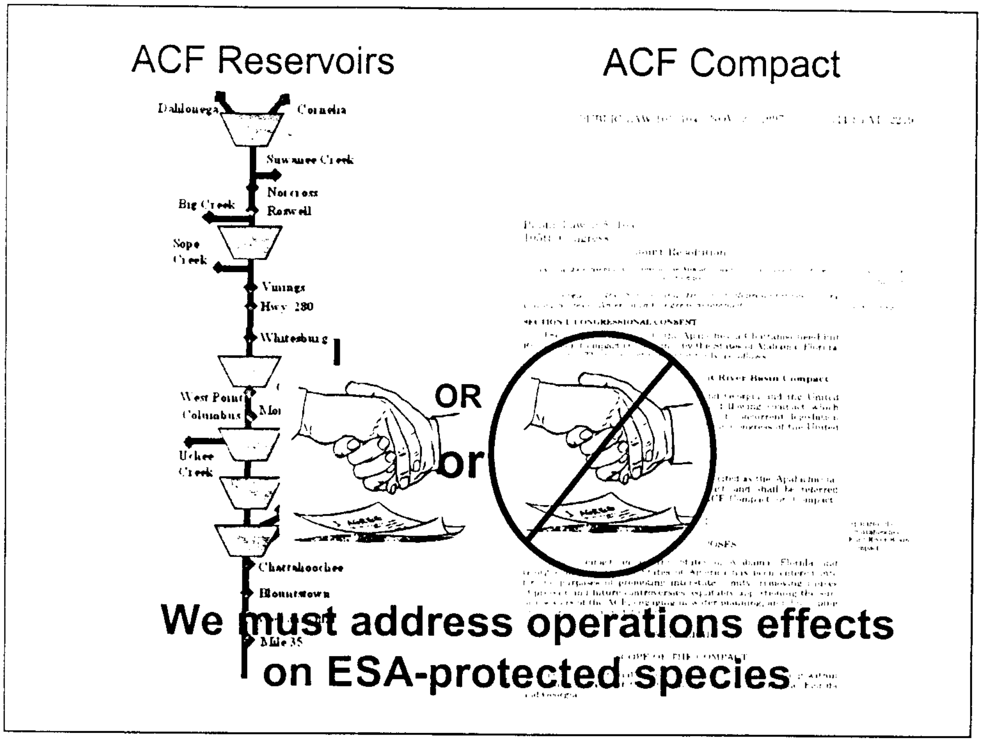


- **Occurs in other basins, but is less common on the Apalachicola than the threeridge**

Also listed in 1998. the biggest clam in the system, also long-lived like the 3-ridge. Occurs also in other systems, but seems more rare in the apalach than the 3-ridge. Females gravid earlier than 3-ridge, Feb-Apr time frame. Host fish is still unknown.



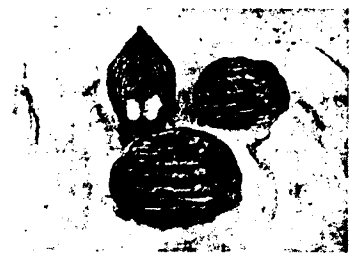
We have worked closely with Mobile District staff over the years on effects of maintaining the nav channel on these species. Our coordination with Mobile on use of disposal sites that avoid impacts to the mussels has been excellent. but have not yet dealt directly under the ESA with effects of dam operations.



That's because in normal and wet years, it hasn't been an issue. In dry years, however, it appears to be. Reservoir ops is a much more complex issue than channel maintenance, because it involves the whole system. We've been preparing to deal comprehensively with operations as part of our role in the ACF compact. But as we noted in our letter to you of June 11, the current drought is necessitating action with or without an allocation agreement. We must act.

Endangered Species Act Section 7 Federal Agencies shall:

- use their authorities for the conservation of listed species
- consult with the Service before undertaking actions that may affect listed species or designated critical habitat
- insure their actions do not jeopardize listed species or adversely modify designated critical habitat



Section 7 of the ESA gives federal agencies 3 principle responsibilities. 1) Agencies have the 7a1 mandate. 2) Agencies are required to consult with the Service on actions that may affect listed species or desig hab, and 3) Agencies are prohibited from doing things that jeopardize or adversely modify. Our job at the Service is to advise agencies on all three counts: what you can do to help get species off the list, what you should do when your actions may affect, and what you must do avoid jeopardy and adverse mod.

Jeopardy and Adverse Modification

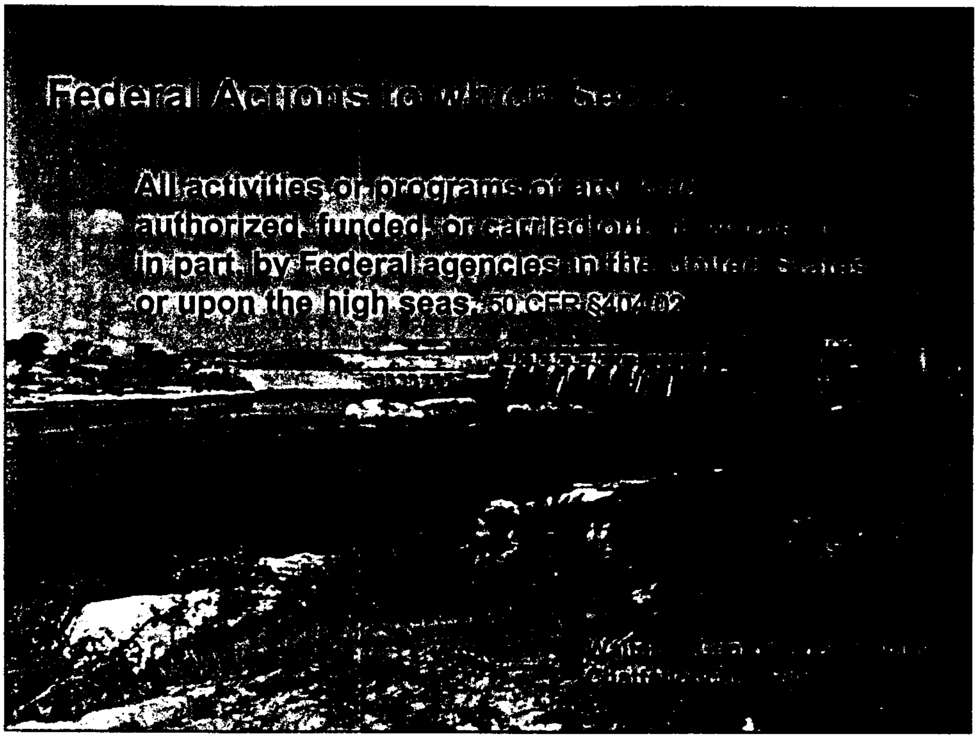
Jeopardize the continued existence:

To engage in an action that reasonably would be expected. directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species.
50 CFR §404.02

Destruction or adverse modification of critical habitat:

A direct or indirect alteration that appreciably diminishes the value of critical habitat for both the survival and recovery of a listed species. Such alterations include, but are not limited to, alterations adversely modifying any of those physical or biological features that were the basis for determining the habitat to be critical.
50 CFR §404.02

On this third count, what does it mean to insure that actions don't jeopardize the continued existence or adversely modify critical habitat? These terms are defined in regulation... Basically agency actions that cause extinction or preclude recovery through impacts to individuals or impacts to their habitat are prohibited, without special exemption by a Secretary-level committee.



Do these requirements of the law apply to federal dam operations? Most definitely yes. Section 7 applies even to emergency actions, although when life and property are threatened, the consultation process necessarily occurs after-the-fact, but is still required.

ESA Section 9
Unauthorized Take Prohibited

"Take" - to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct

"Harm" - significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 CFR 17.3)

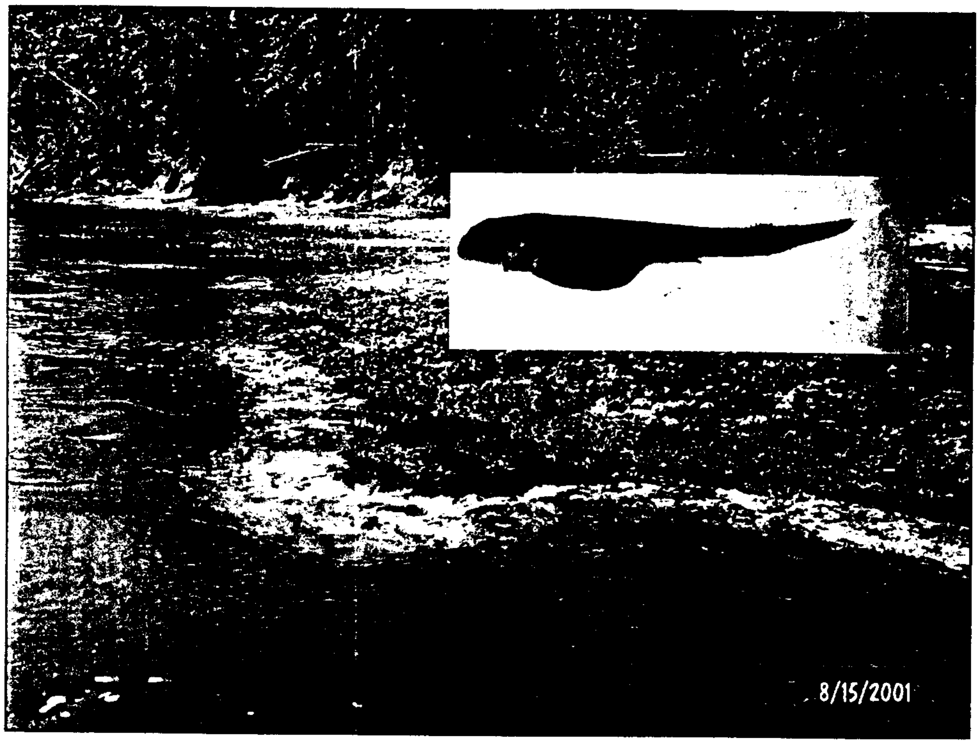
Another section of the Act applies to everyone, not just federal agencies, and that is sect 9, which prohibits take. The Act defines take as.... Regulations further define harm to include... Take that results from otherwise lawful activities, such as dam operations, but doesn't result in jeopardy or adverse mod, can be authorized through section 7.

Should their actions result in take without section 7 compliance, federal agency officials are criminally liable like anyone else under section 9. Our job is to help you comply with section 7, so that section 9 dosen't ever apply.

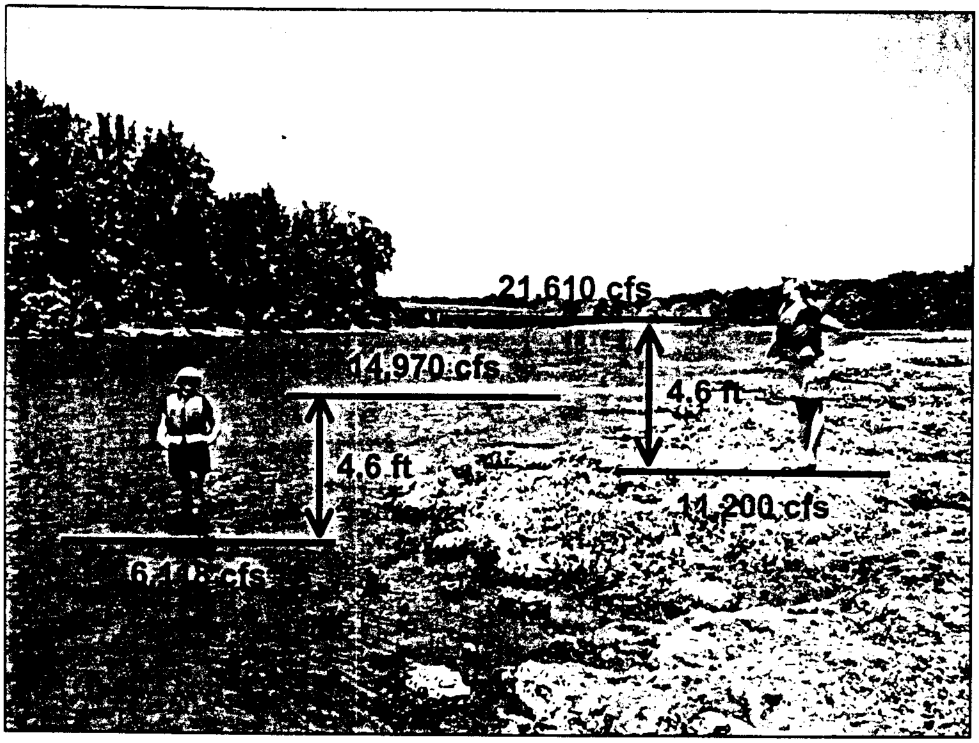
We're here today because operations under the present drought appear to us to have the potential for take. In the summer of 2000, we informed the Mobile District that lowering the system minimum flow to something less than 5000 cfs would adversely affect the listed mussels. With the drought continuing, it is still prudent to prepare for a consultation on low flows operations, which takes time, should the need arise to again consider lowering the WCP minimum flow.

Spring Cre
Flint River
Summer 2

We have seen already considerable mussel mortality during this drought, especially upstream in the Flint Basin. We should explore reasonable means by which federal actions may avoid similar impacts in the regulated reaches of the basin.



This spring, we let you know about the possible dewatering of spawning sites for sturgeon, such as this location, which is a short distance downstream of JWLD. Sturg eggs sink and stick, and need sufficient flow over them during incubation to aerate them and prevent sediment smothering. Operations that change the stage over these rocks and possibly several other sites during spawning could adversely affect the sturgeon in several ways. The most extreme case would be exposing and destroying eggs or larvae following spawning, but perhaps a more likely case is regulating the stage in a way that interrupts or precludes spawning, such as if the fish need a minimum depth of water over these rocks for their courtship behaviors.

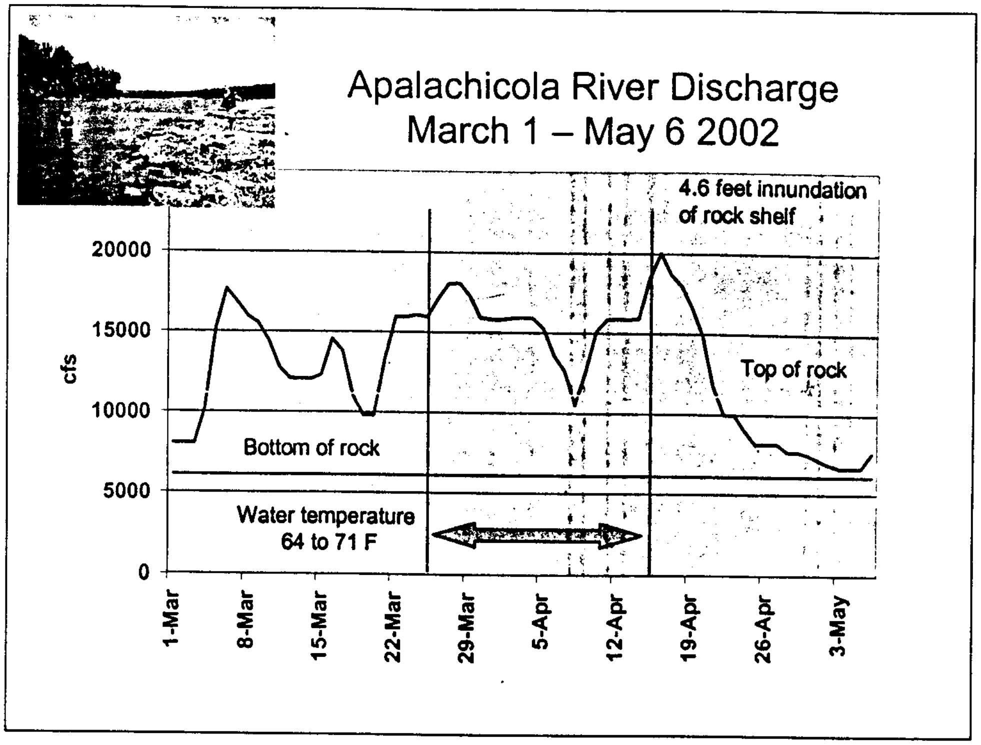


At all of the sites that may support spawning, including this one that is the most likely site, the rock doesn't span the entire stream bed. It's a shelf along one or both banks, which at this site ranges vertically from a stage of about 6 to 11 thousand cfs.

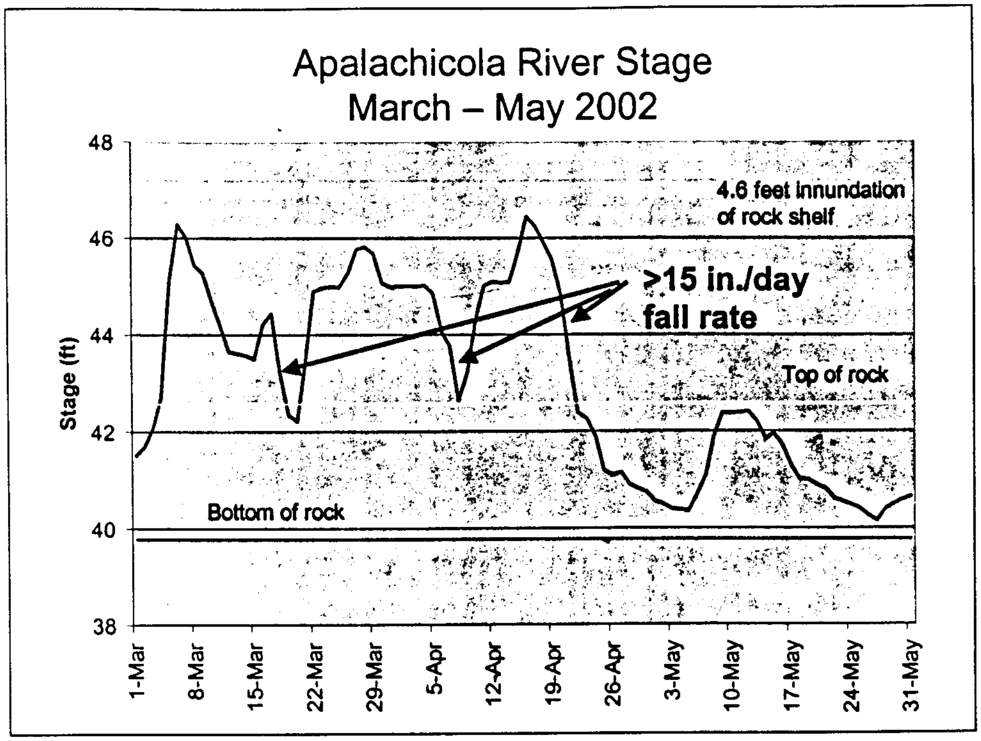
The shallowest depth at which eggs have been collected was 4.6 ft., which translates to ....

This past March and April, the flows were up and down over these stages, which is most unusual. In the 75 years of record at the gage, the tops of the rocks have been exposed only once before this year in the month of March, and that was during the current drought, spring 2000. The upper extent of rock has been exposed only 4 times previously in the month of April, all in the past 6 six years.

These low-flow events in recent springs may or may not have been a problem for the sturgeon, depending on the weather and some unknowns about the species' behavior. Water temps observed where eggs have been collected have ranged from about 64 to 71 degrees F.



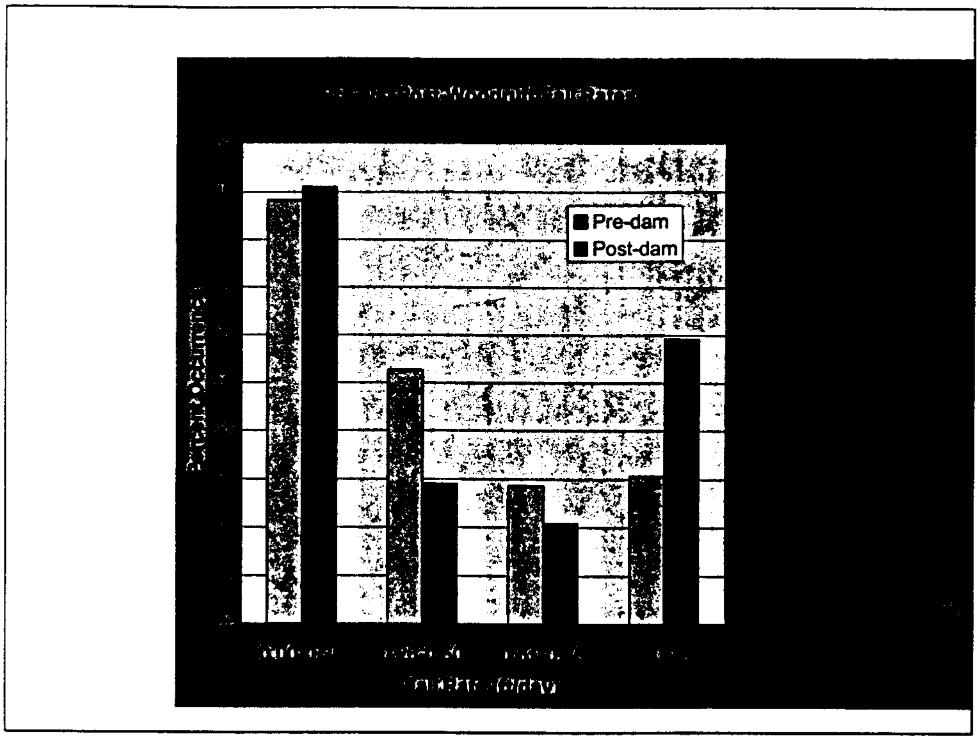
This spring, we believe the river warmed up to this range in this time frame: Mar. 25 to April 15. Was spawning affected? Possibly. We don't know how long it takes a particular male or female to choose a site and ready themselves for spawning, or how long it takes the entire group of reproductive individuals to complete spawning during the spring given suitable habitat conditions. We have egg collections on various systems spanning 9 days to over a month.



This being an unknown, we are concerned about the rate of change of flow. Many fish species have been shown to initiate spawning behavior in response to rising water levels, suspend spawning in response to falling water levels, and of course, falling water levels can expose or strand eggs and larvae. If sturgeon spawning started this year on about Mar 22, there may have been enough time and enough water depth for spawning to occur and eggs to develop to the motile larvae stage. If it started later, we may have lost a year class.

Since its hard to know exactly when, and likely spawning occurs in the pop as a whole over a period of several days if not weeks, we believe the most protective operational practice for the sturgeon would be to maintain fairly steady river stages once temperatures are in the range for spawning, and if necessary, ramp down as gradually as is practicable.

Fall rates as extreme as these (click) run the risk of spawning failure, not only for sturgeon, but other species as well, especially if occurring later in the season, when many more species are reproductively active.



Breaking it down by frequency, you get this (histogram). I believe FWC will speak to this issue relative to game fish, but it affects the T&E as well. Sturgeon are likely less vulnerable than the game fish to impacts of rapid drawdowns because their eggs have a very brief incubation time, about 2 days depending on temperature, but their eggs and larvae can be destroyed just the same if their spawning areas are exposed at the wrong time. The same goes for the mussels. Mussels are not very mobile, but they can move short distances and burrow into the substrate in response to rising or falling water levels if given enough time.

Recommended Actions:

Short Term

Section 7 Biological Assessment
and Biological Opinion for operations effects
on listed species as part of a revised
water control plan

Long Term

Collect data on:
- locations, depths, and duration of sturgeon spawning
- mussel distribution relative to stage,
- extent of mussel use of off-main channel areas

and

Revisit any operational decisions reached
in the short term.

So, what do we think needs to be done. We need to evaluate the effects of current operational practices on the listed species. The official mechanism for this is the BA/BO in the section 7 process. We'd like to work with you to scope it out beginning as soon as possible.

And in the longer term, we need to know more. I mentioned earlier the duration of spawning. This will make a huge difference operationally if certain flows should be sustained for a couple weeks vs. a month or more in order to prevent loss of a year class. Likewise, we need more information about the mussels. It may be that a very small portion of the population is vulnerable, or a majority. When we know the answers to some of these questions, we'll need to come back to the decisions we made in the short term based on the best information available now.

OBJECTIVES

- Improve interagency communications.

- Review impacts to fish spawning during falling river levels (0.5 ft to 1.0 ft/day).

- Develop new coordination agreement and/or modify SAM SOP 1130-2-9 (project operations) for "sharing" impacts to fish during low flow periods.

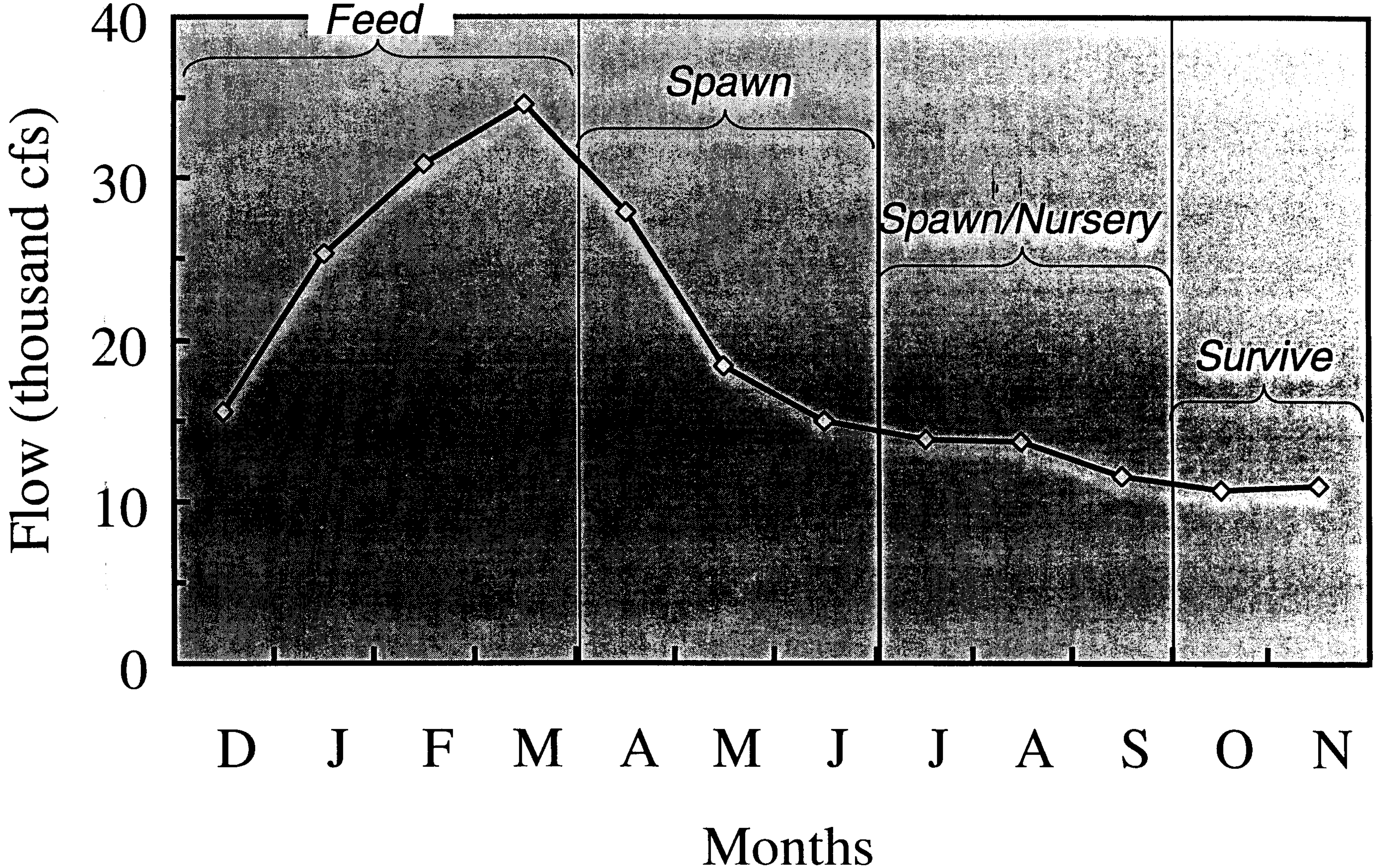
Communications Working

- FWC is called if dredging is necessary before the May 15th Striped Bass spawning window.
- COE and interagency team coordinate well with slough enhancement projects.
- FWC receives updates on reservoir levels and projected river stages.

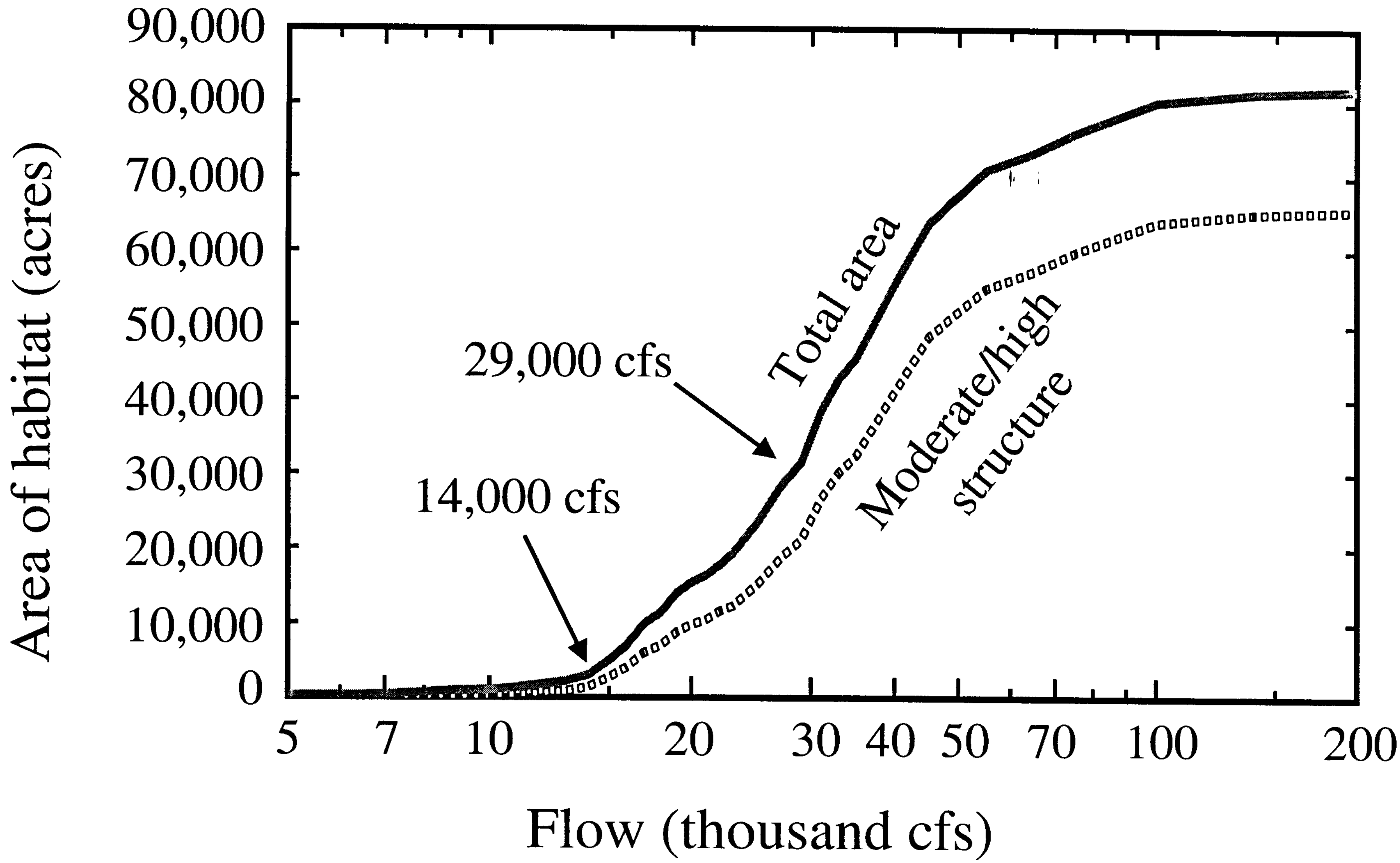
Communications Not Working

- **Limited FWC input to reduce natural resource impacts on the Apalachicola river from COE water management operations.**
  - **Initiation of spring spawning activities for Apalachicola river sport fish.**
  - **Rapidly falling Apalachicola river water levels during spring/summer.**

Median monthly flow 1922-95



Connected aquatic habitat in relation to flow

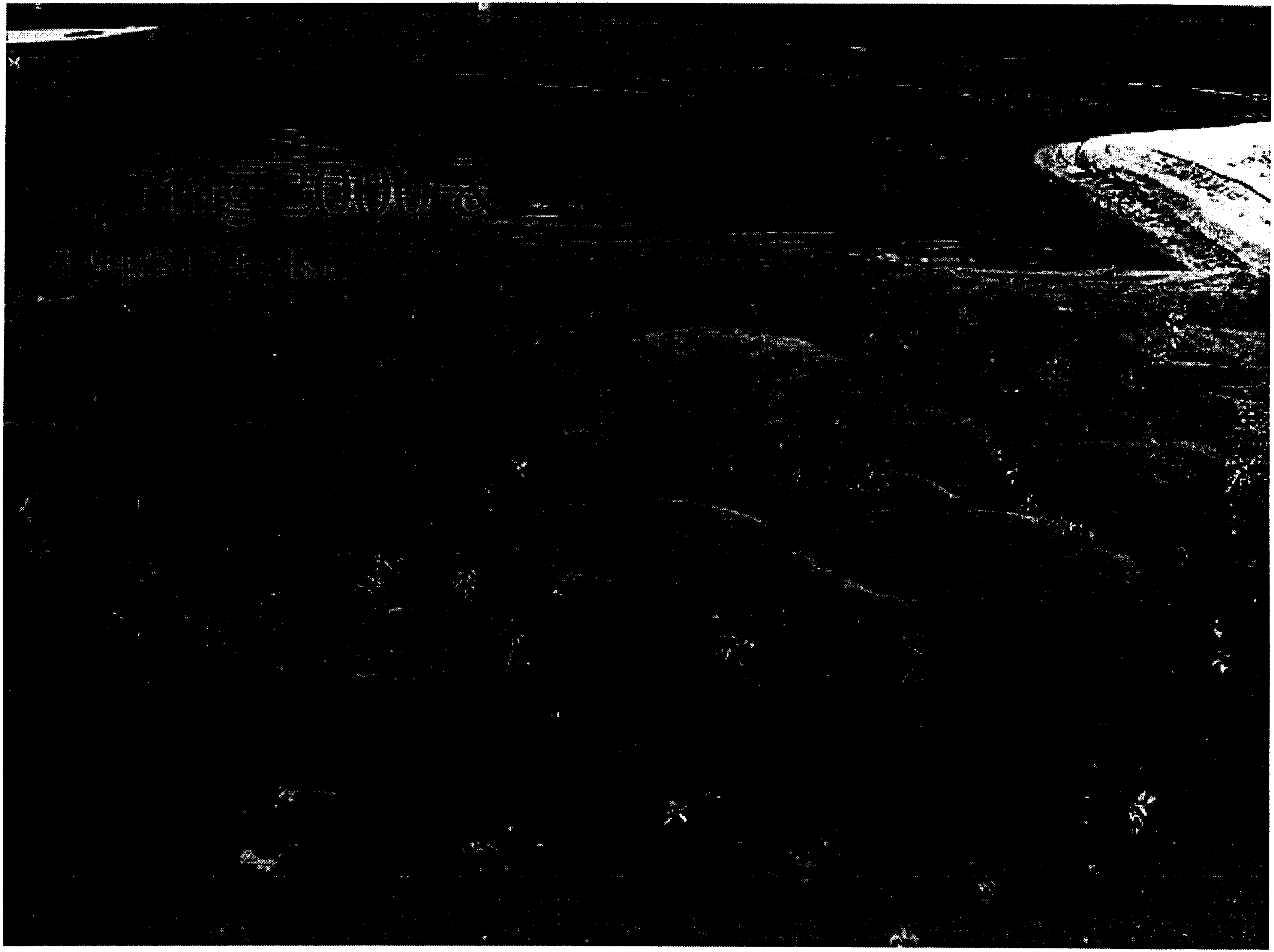


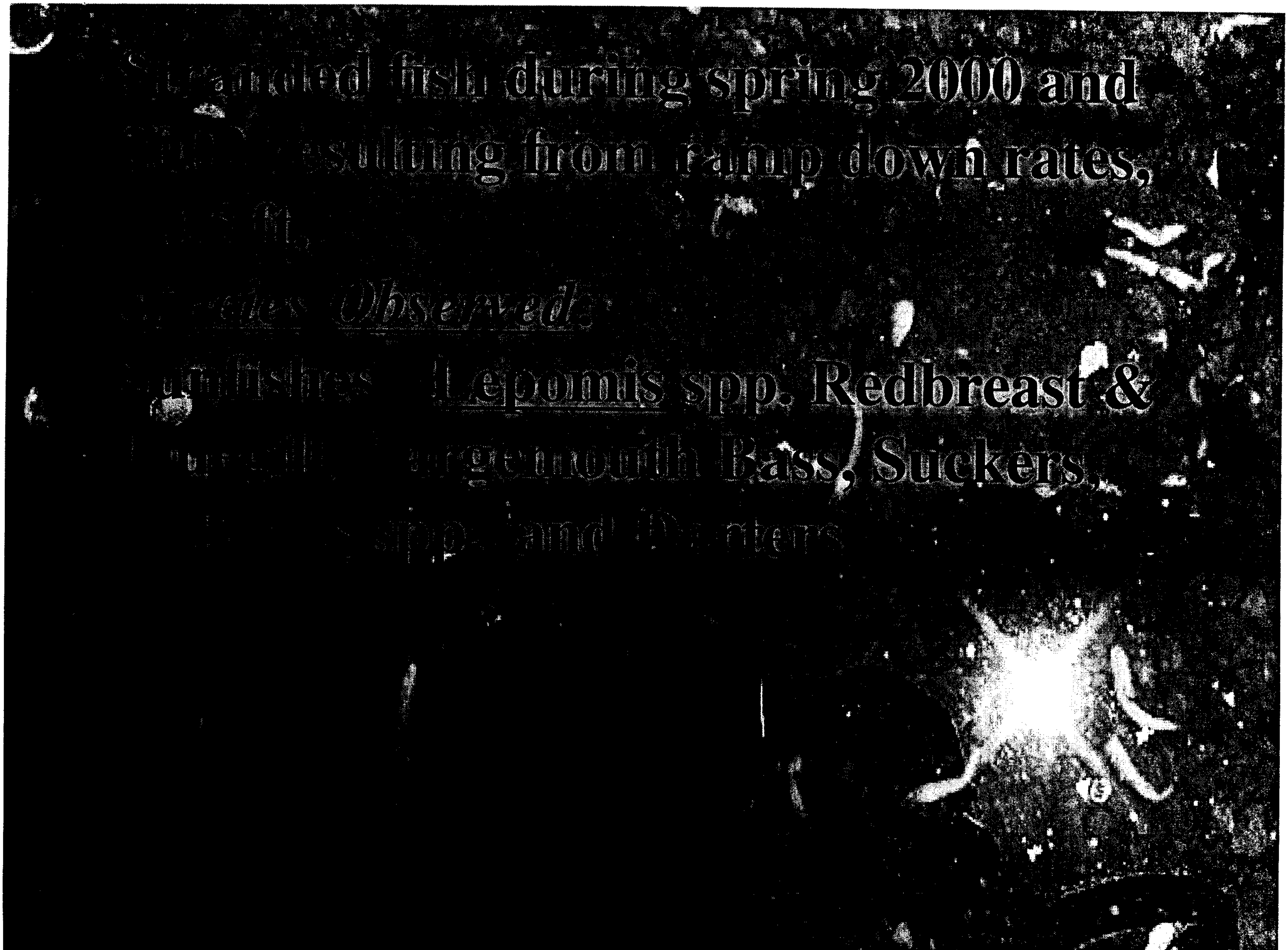
Impacts to Fish Spawning Apalachicola River, 2000 & 2002.

- Thousands of active fish nests with newly hatched fry were left high and dry for 75 miles of river in 2000 and 2002.

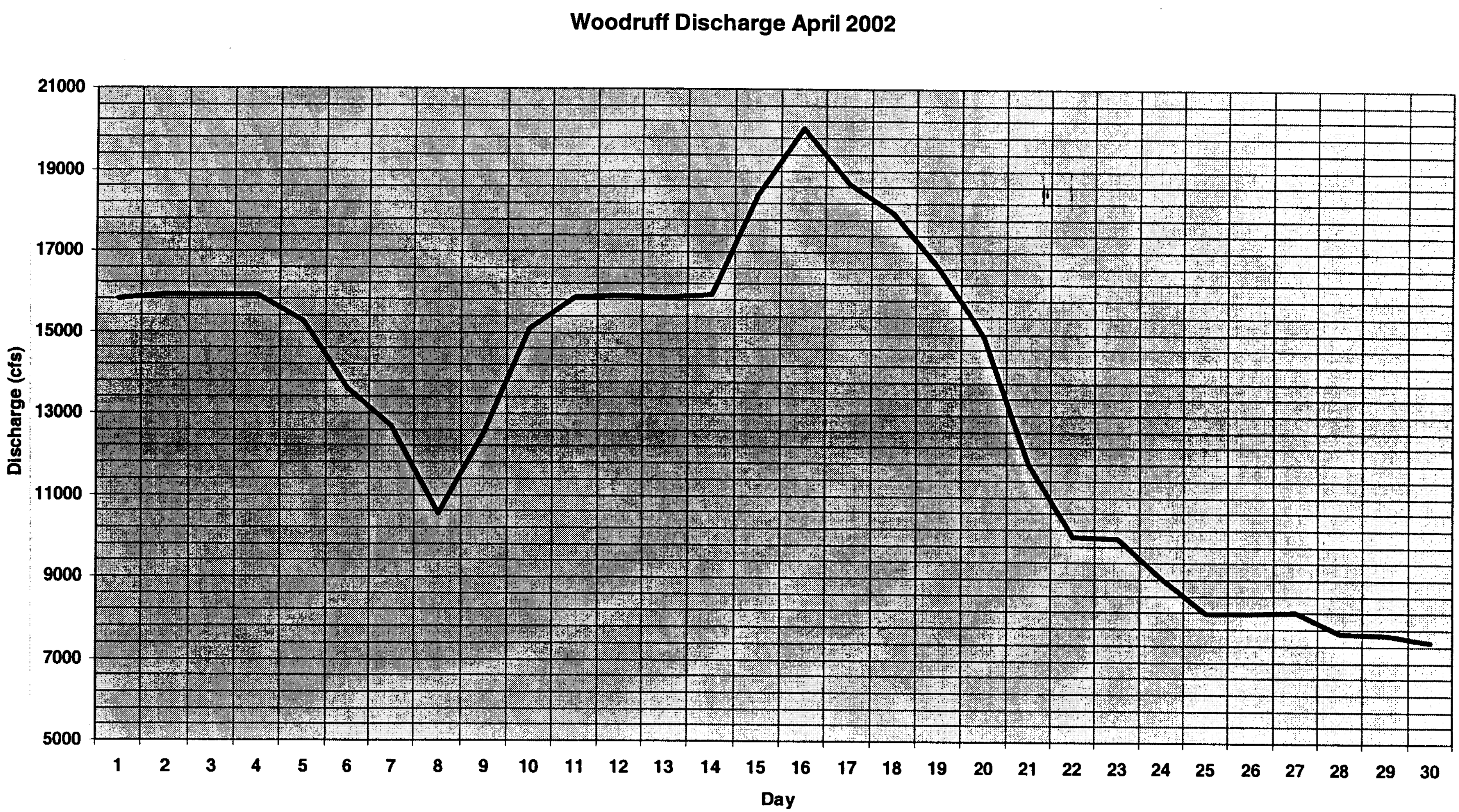
- Thousands of adult sportfish were stranded by rapidly falling water levels.

- Preliminary age analysis indicate largemouth bass, redbreast sunfish and bluegill have weak cohorts for 2000.



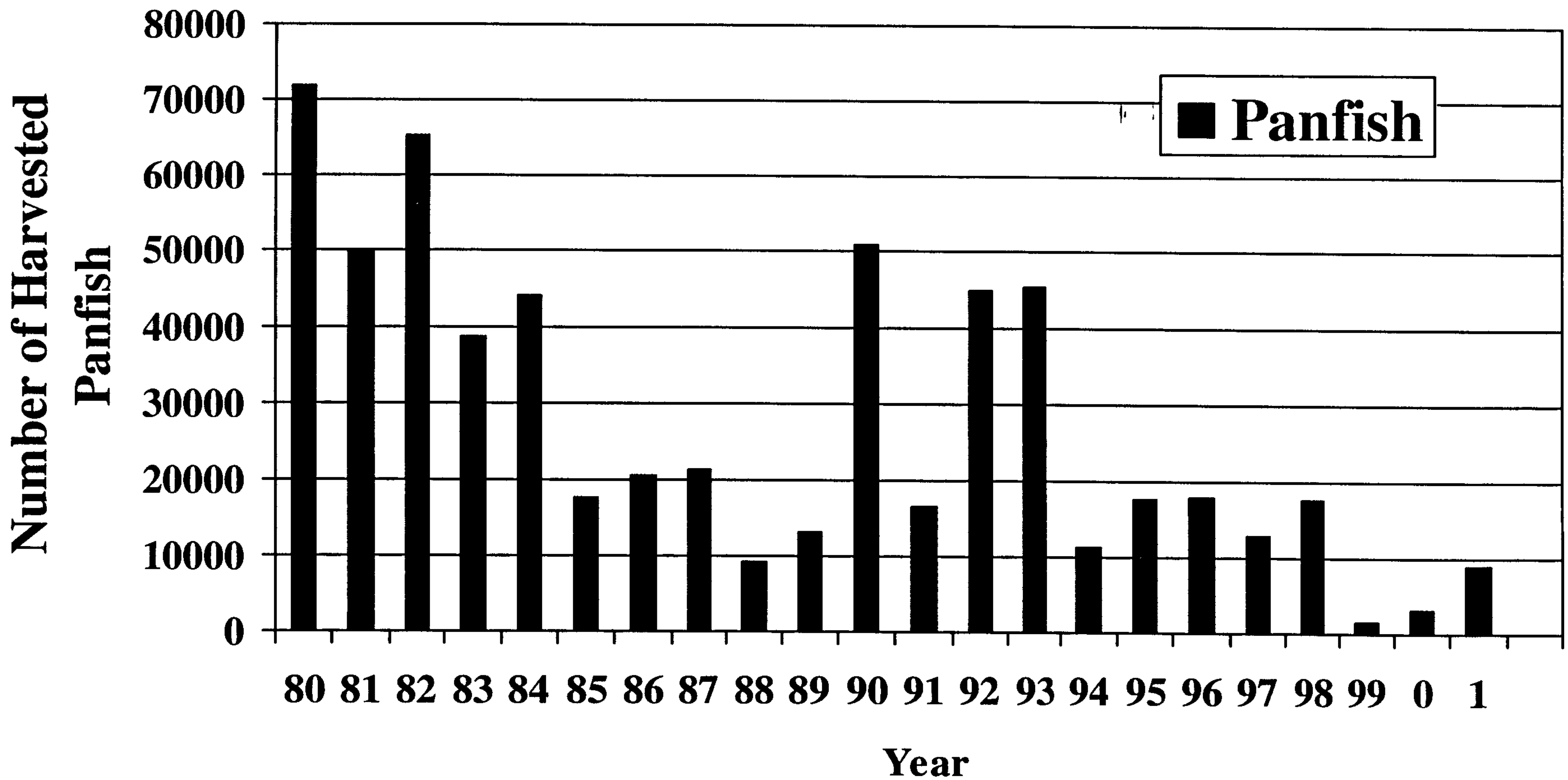

tranded fish during spring 2000 and
esulting from ramp down rates,
ft.
ecies Observed:
unfishes Lepomis spp. Redbreast &
argemouth Bass, Suckers,
spp. and arters


Stranded sportfish May, 2000.

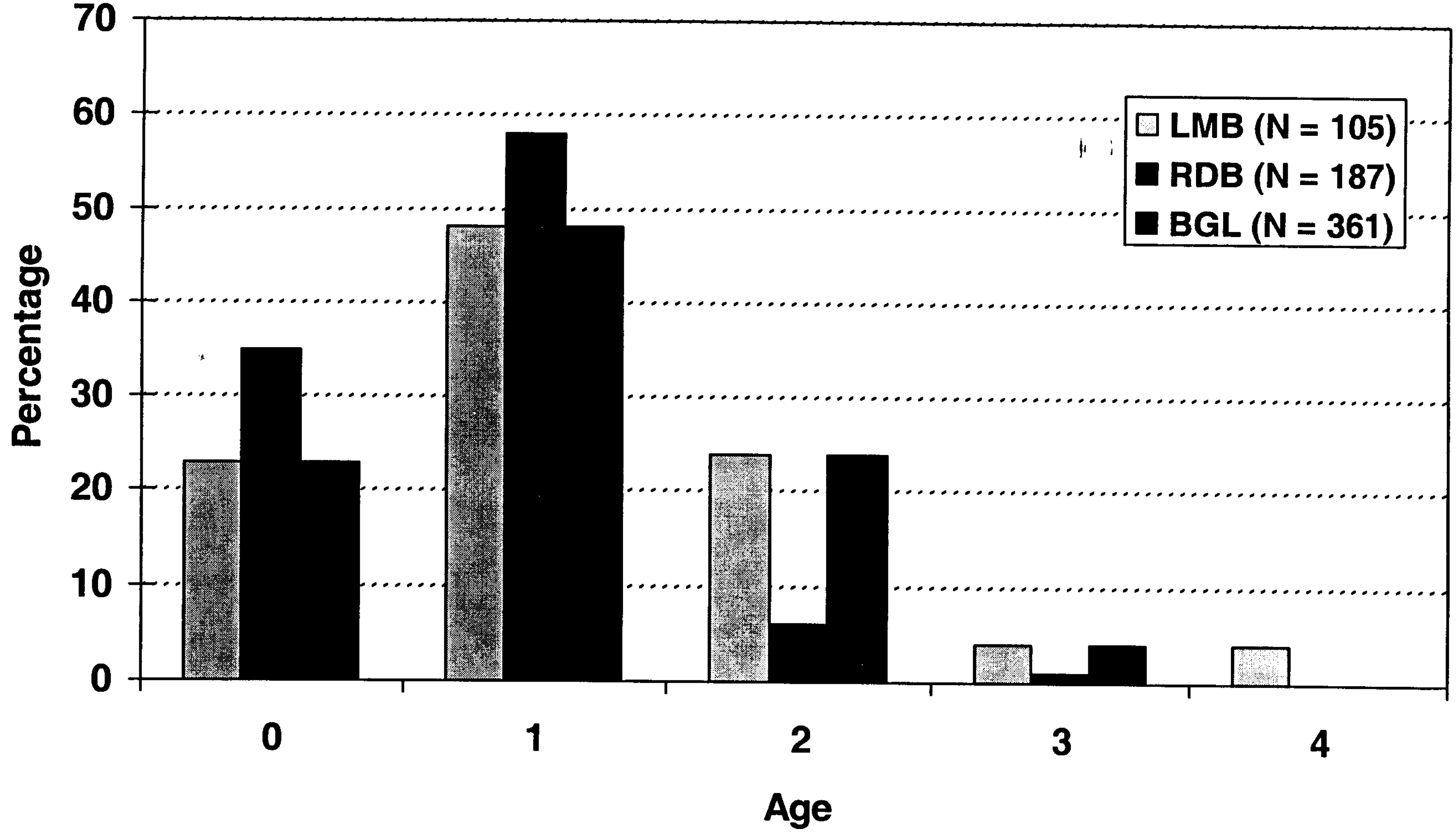


Woodruff Discharge April 2002
Discharge (cfs)
21000
19000
17000
15000
13000
11000
9000
7000
5000
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30
Day

Upper Apalachicola River Spring Creel Survey, Panfish Harvest 1980 - 2001



Age Distribution for Largemouth Bass, Redbreast Sunfish and Bluegill collected in Apalachicola River (Nov. 2000)



Apalachicola Bay Issues

- Spring flows important for nursery production with a gradual increase in salinity due to reduced flows.

- Summer freshets important for primary production and decrease in salinity (decreased oyster predation).

Recommendations

- Develop a formal agreement to minimize & share natural resource impacts on the ACF system.

- Revise SAM SOP 1130-2-9 to include stable water levels in the Apalachicola river during spawning season.

- Reduce ramp down rates during spawning periods, flow levels between 29,000 and 14,000 cfs, and critical flows (<14,000) in the Apalachicola river.

- Develop joint FWC/COE fish monitoring sops to aid in future decision making(ramp down rates - reservoirs vs. Rivers) during low flow periods.

Other Important Issues

- Improve coordination and review of lake Seminole aquatic plant management.

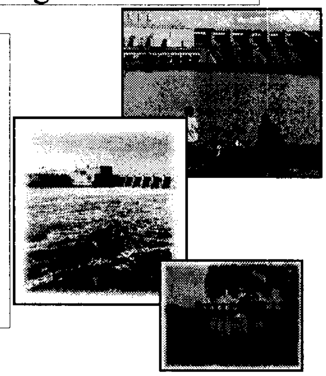
- Consider striped bass thermal refugia (cool water sloughs) flow requirements during summer and potential modification requirements of future enhancement - restoration projects.

- Adjust JWLD gate & turbine operations to aid anglers during peak spring fishing.

ACF Fish Spawn Operation and the Apalachicola River

Water Management Issues

- System Limitations
- Ramp Down
- “Spawn Window”
- Alternative Operations for Spawn
- Summary



System Limitations

System Limitations - Storage and Timing

- **Spawn season – critical time for system**
- **Seasonal flood control - 25-50% less available storage**
- **System manager decision - Prudent system discharge?**
- **Balance flood control and refill - Consider the outlook**

System Limitations - Discharge and Refill

- **Discharge from Storage**
  - **5,000 cfs a day = 9,900 ac-ft**
  - **20,000 cfs a day = 39,600 ac-ft**
- **System Inflows 2002**
  - **March 40% - (16950 cfs)**
  - **April 45% - (14300 cfs)**
  - **May 40% - (8070 cfs)**
- **Occurred 3 of the last 4 springs**

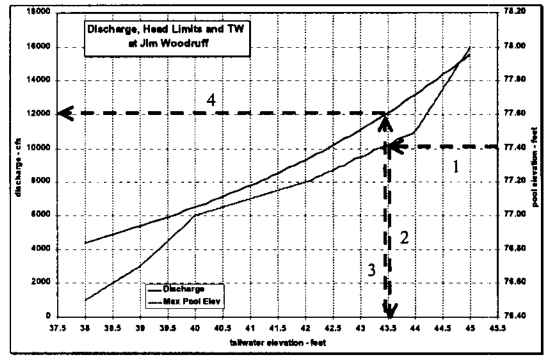
System Limitations – Spillway Gates at Woodruff Dam

- **Up to 15,000 cfs Turbines**
- **Over 15,000 cfs Spillway**
- **Spillway Gates – crane operated**
- **One Gate Step – approx. 2000 cfs**
- **Fine Tuning – Hang a gate 1000 cfs range**
- **Transition from Gates to Turbines - Increased uncertainty**

System Limitations -
Head Limits at Woodruff Dam

- **Variable maximum HW / TW difference**
- **TW below 44.5 - Head Limits often control**
- **TW 44.5 = 15,000 cfs range**
- **Maximum Pool controlled by TW**
- **TW controlled by Discharge**

Head Limits – Highly Restricted Operation



System Limitations
Current Operation for Lake Spawn

- **+ / - 6 inch pool elevation for spawn**
- **Typically 3 to 4 weeks (flexible)**
- **Rise over 6 inches - shift range up (negotiable)**
- **If deviation foreseen – notification and contingency**
- **Typically coincides with river spawn**

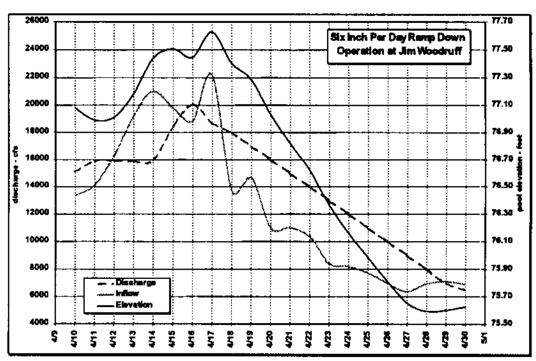
Ramp Down

Ramp Down – FWC Requested Operation

Discharge should be decreased at a rate that ensures the river stage will not drop more than 6 inches per day.

- Attempt to mimic "natural flows"
- Minimize impacts on downstream habitat
- Minimize trapping of fish in out-of-bank pools after high flows
- Reduce bank sloughing

Ramp Down – Effect on Woodruff



Ramp Down - Analysis of Options

- Support from Walter F. George
- Support from Walter F. George and West Point
- 6-inch to 1-foot reduction

In any case consider both the recent trends and current situation of the system

Ramp Down - Conclusions

- Jim Woodruff or Walter George - Unable to support
- System storage - limited support dependent on current situation
- Other Impacts
  - forecasting
  - discharge controls
  - routing time
  - state of system
- 6 inches per day as a goal, but 6 inches to 1 foot per day likely

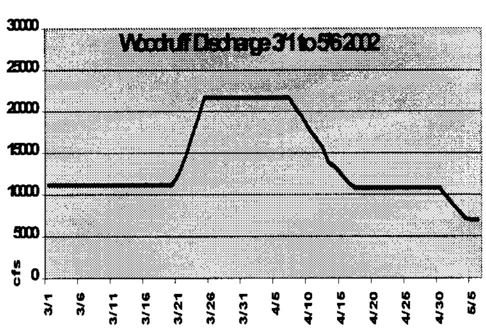
"Spawn Window"

"Spawn Window" – Requested Operation

USFWS has proposed a sustained increase in discharge during the spawn of the Gulf Sturgeon with ramping limits at the end of the "window" similar to those proposed by FWC

- It is assumed that this would aid other species
- Based on goal of inundating suspected prime habitat at peak spawn
- Request for an operational scheme of "sharing the pain"

Requested "Spawn Window"



Spawn Season Challenges

- Head Limits at Woodruff
- Spawn in upstream lakes
- Available storage

Alternative Operation for River and Lake Spawn

- If water is available - increasing, sustaining and ramping down flows may be possible
- How much depends on conditions of year
- Improved planning and coordination will minimize impacts to all parties

In any given year decisions would have to be made based on balancing authorized project purposes and uncertainty of future conditions

Summary

- System managers have many authorized project purposes to balance
- Drought contingency operations alter the priorities of project purposes
- Head Limits often control discharge at Woodruff – difficult to maintain from storage
- Moving water in the system – lag time, attenuation and other uncertainties
- Using storage in spring is a risk in dry years
- Forecasts often unreliable
- Quick decisions on limited data made daily
- Decisions will not make everyone happy
- We are always looking for ways to improve and are open to suggestion

Questions?

DEPARTMENT OF THE ARMY
Mobile District, Corps of Engineers
P. O. Box 2288
Mobile, Alabama 36628-0001

Project Operations
LAKE REGULATION AND COORDINATION FOR FISH
MANAGEMENT PURPOSES

1. Purpose. To provide a standing operating procedure (SOP) to be followed by OP-TR, PD-EI, EN-HW, PA and selected Mobile District (MDO) Operations Division field offices to implement South Atlantic Division DR 1130-2-16, dated 1 April 1993. While this SOP targets largemouth and spotted bass, other fish species with similar spawning habits should also benefit from increased successful spawns.

During the reproduction period, the lake water level should not be lowered more than six inches in elevation, if doing so does not conflict with authorized project purposes, to prevent stranding or exposing fish eggs.

2. Applicability. This SOP applies to the operation of Allatoona Lake, Lake Seminole, Okatibbee Lake, Lake Sidney Lanier, Walter F. George Lake and West Point Lake. MDO staff in OP, PD-EI, EN-HW and PA are involved in the successful implementation of this SOP.

3. References.

a. Required. ER 1130-2-400, Management of Natural Resources and Outdoor Recreation.

b. Required. SADvR 1130-2-16, Lake Regulation and Coordination for Fish Management Purposes.

c. Related. SADvR 1130-2-18, Preparation of Operational Management Plans at Civil Works Water Resources Projects.

4. Procedures.

a. OP-TR will forward a memorandum to appropriate field offices during February each year to inform project staffs of any changes in reporting procedures and to alert them to the upcoming spawning season.

b. Each spring, project personnel will begin monitoring water surface temperature (WST) from two designated monitoring station locations (see Appendix A) in each lake as the water reaches 60 to 65 degrees Fahrenheit.

* This SOP supersedes SAM SOP 1130-2-9, 1 February 1989.

Historically, these temperatures are reached in February-March at Lake Seminole, Okatibbee Lake and Walter F. George Lake, while they are reached in March-April at Allatoona Lake, Lake Sidney Lanier and West Point Lake.

WST should be taken each work day and continued for a period of three weeks after the water temperature reaches 70 degrees Fahrenheit (F). If the water temperature falls back into the 60's for a period of two days or longer, the timeframe for temperature monitoring should be extended until three weeks of data is collected with no more than two consecutive days where the temperature is below 70 degrees F.

The temperature readings should be taken between 1000 and 1630 hours at the designated monitoring locations where the water is approximately three to five feet deep. The temperature should be obtained by submersing a thermometer to a depth of six inches from the surface and holding it for 120 seconds before reading.

This monitoring regime should provide sufficient WST data to identify both the spotted and largemouth bass spawning periods. These spawning periods are considered in water management decisions with the objective of minimizing downward water level fluctuations until the spawn is complete. The spawning period for the spotted bass (Allatoona and Lanier) typically begins at a WST of approximately 63 degrees F. Largemouth bass spawn in the temperature range of 65 to 70 degrees F.

c. The WST information should be furnished daily by project personnel to the Powerhouse Shift Operator for insertion into the data collection system and will be transmitted daily by the Operator to EN-HW. At Okatibbee Lake, where hydropower is not a project purpose, the information should be furnished directly to EN-HW by telephone. The weekly WST Data Sheet (Appendix B) should be faxed to OP-TR on Tuesday of each week after the WST has been taken on that day.

d. Project personnel should contact local state fisheries management personnel when water temperature monitoring is initiated and keep in close contact with them throughout the spawning period. Information regarding the actual progress of the spawn (i.e., has started, is in progress, has ended) should be relayed to MDO through OP-TR and noted on the WST Data Sheet.

e. EN-HW personnel will notify PD-EI when field personnel begin monitoring WST. PD-EI will be responsible for obtaining the daily data from EN-HW. EN-HW will also notify the PA Office when the fish spawning season begins and will invite PA to specific weekly water management meetings when important decisions having public impact are likely to be made. EN-HW will conduct other actions and procedures specified in SADvR 1130-2-16.

f. PD-EI will maintain an updated list of state fisheries biologists for the lake projects. PD-EI personnel will attend weekly water management meetings during the spawning season upon notification by EN-HW that field personnel have initiated WST monitoring. PD-EI will relay pertinent information to OP, EN, and PA at the weekly water management meetings and will send weekly, either by mail or telephone, temperature and water elevation data to appropriate state fisheries personnel. Significant decisions based on the weekly meetings will also be relayed to state fisheries personnel by PD-EI. At the conclusion of spawning season PD-EI will forward a summary of all data collected to state fisheries management agencies.

g. OP-TR will review the data sheets forwarded from the field offices and will present pertinent information at the weekly water management meetings. Significant decisions made at these meetings will be related to project personnel by OP-TR. OP-TR will furnish WST information to SAD-CO-R following the bass spawning season each year.

h. OP-TR, EN-HW, PD-EI and PA will coordinate directly with each other or call additional meetings as the need arises.

FOR THE COMMANDER:

Richard F. Davis
Major, Corps of Engineers
Deputy District Engineer

2 Appendices:
Appendix A - WST Station Locations
Appendix B - CESAM Form 1148, WST Data Sheet

APPENDIX A

WATER SURFACE TEMPERATURE STATION LOCATIONS

ALLATOONA LAKE

Station 1 - Cooper Branch #1 (Corps boathouse)
Station 2 - Bartow County Park

LAKE SEMINOLE

Station 1 - Operations Area (Corps boathouse - east end of dam)
Station 2 - Chattahoochee Park (boat ramp)

OKATIBBEE LAKE

Station 1 - Operations Area (Corps boathouse)
Station 2 - Gin Creek Park

LAKE SIDNEY LANIER

Station 1 - Buford Dam (cove between RMO and Lower Overlook)
Station 2 - Gainesville Marina (boat ramp)

WALTER F. GEORGE LAKE

Station 1 - Operations Area (fueling dock)
Station 2 - East Bank Park (courtesy dock)

WEST POINT LAKE

Station 1 - Long Cane Park (courtesy dock)
Station 2 - West Overlook II (courtesy dock at ramp)

APPENDIX B

WATER SURFACE TEMPERATURE DATA SHEET

LAKE: ____________________________

YEAR: _________

	WATER SURFACE TEMP		Lake	
Month/Day	Station #1	Station #2	Elevation	Comments

CESAM FORM 1148
23 Feb 95

Enclosure 10

Division Regulation DR 1130-2-16

DEPARTMENT OF THE ARMY
South Atlantic Division, Corps of Engineers
Room 9M15, 60 Forsyth Street, S. W.
Atlanta, Georgia 30303-8801

CESAD-CM-OC

Regulation
No. 1130-2-16

30 March 2001

Project Operation
LAKE REGULATION AND COORDINATION FOR FISH MANAGEMENT PURPOSES

Supplementation of this regulation is permitted.
Furnish one copy of each supplement to CESAD-CM-OC.

1. Purpose. This regulation provides policy for administration of a water management program to balance the multiple resource management responsibilities of water resource projects during the fish-spawning season. This policy will establish priority for water level management to aid fish spawning for the purpose of maintaining balanced fish populations on Corps water resources projects within the South Atlantic Division. Stable lake levels should be maintained for approximately 4 to 6 weeks each spring. Under adverse conditions such as flood or drought, stable lake levels may not be possible. All other management responsibilities should be scheduled outside of the fish-spawning window.

2. Applicability. This regulation is applicable to the following lakes in the South Atlantic Division:

a. Allatoona
b. B. Everett Jordan
c. Falls
d. Hartwell
e. J. Strom Thurmond
f. John H. Kerr
g. Okatibbee
h. Philpott

* This regulation supersedes DR 1130-2-16, 1 April 1993.

i. Richard B. Russell
j. Seminole
k. Sidney Lanier
l. Walter F. George
m. West Point
n. W. Kerr Scott

3. References

a. Required. ER 1130-2-540, Chapter 2, Natural Resources Stewardship

b. Related. ER 1130-2-550, Chapter 3, Project Master Plans and Operational Management Plans. EO 12962, Recreational Fisheries, 7 June 1995

4. Responsibilities

a. District Engineer. The District Engineer is responsible for the required coordination among Water Management Personnel and Operations Personnel in preventing water level drawdowns during the fish spawning season.

b. District Water Management and Operations Personnel. Water Management Personnel will give advance notice to Operations Personnel and the District Public Affairs Officer of any proposed water management action that may be perceived by the public and/or other stakeholders as detrimental to fish spawning success. Operations Personnel will immediately advise South Atlantic Division Operations Personnel and, within 24 hours of notification, advise state, federal, and local fish and wildlife and environmental groups, as applicable, of these proposed actions.

c. District Public Affairs Officer. The District Public Affairs Officer will, within 24 hours of notification, through press releases or other necessary means advise the news media of specific water management actions that are potentially detrimental to the fish spawn. Reasons for the specific water management action should be clearly explained.

5. Procedures

a. General. ER 1130-2-540 provides guidance for programs and activities related to environmental stewardship and the management of natural resources. The program objectives include management of natural resources on Corps of Engineers administered land and water in accordance with ecosystem management principles, to ensure their continued availability. Stewardship through natural resources management ensures the conservation, preservation or protection of natural resources for present and future generations. Maintaining stable water levels during the spring fish-spawning season is primarily targeted at largemouth bass. Largemouth bass are the primary predator in southeastern reservoirs and achieving successful spawns is necessary to maintain desirable fish populations. Following the second or third year of poor or unsuccessful spawning, forage fish may become overpopulated creating species imbalance and resultant poor sport fishing due to the decrease in the number of largemouth bass growing into the larger, harvestable size classes.

b. Water Temperatures. Largemouth bass spawn during spring when water temperatures increase to approximately 65 degrees (18 degrees Celsius). Water temperature monitoring should begin during early spring as the lake water reaches 60 degrees Fahrenheit (16 degrees Celsius). The spawning period is best defined using water temperature data coupled with observation data provided by fishery professionals. However, if water temperature data is the only information available, the spawning period should be defined as beginning when water temperatures reach 65 degrees Fahrenheit (18 degrees Celsius) until three (3) weeks after water temperatures reach 70 degrees Fahrenheit (21 degrees Celsius). Water temperatures should be taken each day throughout this period. The temperature readings should be taken in a sunny cove between 1000 and 1630 hours by submersing the thermometer six (6) inches deep where the water is approximately three (3) to five (5) feet deep.

c. Fish Spawning Observation. Water temperature data used for determining the spawning season will be supplemented with observation data provided by fishery professionals. Largemouth bass can often be observed on their nests during the spawning season. If lake conditions (water clarity, etc.) allow, qualified Project Natural Resources Management personnel or state fishery biologists may conduct visual surveys or fish sampling to determine when spawning begins or ends.

d. Lake Level Management. Project Natural Resources Management personnel, in cooperation with fishery personnel of the applicable state fishery agency, will advise District Water Management personnel of the beginning and ending of the spawning season. The District will have final authority in selecting an operational window to support the largemouth bass spawn. This operational window should be timed to coincide with the peak spawning period and should provide stable lake levels to prevent the stranding of eggs and abandonment of nests. Raising the water level a few feet during the spawning season does not impact bass spawning unless the water level is then lowered more than six (6) inches. Throughout the spawning season, water levels should never be lowered more than six (6) inches below the highest lake elevation recorded during the operational spawning window. If the high water level exceeds the normal summer pool elevation at the end of the spawning window, efforts must be made to adjust lake levels down to normal summer or conservation pool to prevent loss of shoreline vegetation. Loss of shoreline vegetation causes increased erosion, which reduces future spawning habitat.

e. Special Management Considerations. Special management considerations may be required to fulfill specific stewardship objectives. Each District may implement modifications to water management during the spawning season when fish species other than largemouth bass are identified by state resources agencies as being a higher priority. When adopting special management considerations, individual water management plans should be developed in consultation with state fishery agencies on an annual basis.

f. Exceptions

(1) An exception to lake level management in paragraph 5.d. above may be made for the John H. Kerr Reservoir during years when downstream flows are supplemented for striped bass management providing storage for this purpose remains in the reservoir. Preference may be given to releases for maintaining the striped bass fishery downstream from the dam over that of largemouth bass spawning in the John H. Kerr Reservoir.

(2) An exception to the lake level management in paragraph 5.d. above may be made for Richard B. Russell Lake in order to maintain a minimum net head of 145 feet to provide designed hydropower capacity output.

6. Documentation. The actions required to implement this policy should be included in the Water Control Manual and the Project's Operational Management Plan (OMP).

FOR THE COMMANDER:

TERRY R. YOUNGBLUTH
Colonel, EN
Deputy Commander

Enclosure 11

CESAM SOP 1130-2-9

CESAM-OP-TR

SAM SOP 1130-2-9
XX Month Year

DEPARTMENT OF THE ARMY
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, Alabama, 36628-0001

Project Operations
RESERVOIR REGULATION AND COORDINATION
FOR FISH MANAGEMENT PURPOSES

1. Purpose. To provide a standing operating procedure (SOP) to be followed by Mobile District staff and selected Operations Division field offices to implement South Atlantic Division Regulation DR 1130-2-16, Project Operations, Lake Regulation and Coordination for Fish Management Purposes. This SOP (1) identifies designated periods of time within which fish spawn operations will be conducted at specific projects, (2) establishes protocols for coordination between the U.S. Fish and Wildlife Service (FWS), State fisheries personnel, and the Corps, and (3) provides for development of an annual plan for special water management operations by the Corps, in coordination with the FWS and the State fisheries agencies, that would balance impacts and benefits to both reservoir and riverine fisheries during the spring fish spawning period. This SOP is intended to benefit multiple sport fish and forage fish species having similar spawning habits.

2. Applicability. This SOP applies to the operation of Allatoona Lake, Okatibbee Lake, Lake Sidney Lanier, West Point Lake, Walter F. George Lake, Lake Seminole, and the Apalachicola River. In addition to project office staffs, technical and support staffs in the Mobile District Office have significant roles in the successful implementation of this SOP. Key offices are listed below.

Operations Division	OP-TR
Planning and Environmental Division	PD-EI
Engineering Division	EN-HW
Public Affairs Office	PA

3. References.

a. ER 1130-2-540, Environmental Stewardship Operation and Maintenance Polices, Chapter 2, Natural Resources Stewardship.

b. EP 1130-2-540, Environmental Stewardship Operation and Maintenance Guidance and Procedures, Chapter 2, Natural Resources Stewardship

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This standing operating procedure supercedes District SOP 1130-2-9 dated 23 Feb 1995

c. ER 1130-2-550, Recreation Operation and Maintenance Polices, Chapter 3, Project Master Plans and Operational Management Plans.

d. EP 1130-2-550, Recreation Operation and Maintenance Guidance and Procedures, Chapter 3, Project Master Plans and Operational Management Plans.

e. DR 1130-2-16, Lake Regulation and Coordination for Fish Management Purposes.

f. DR 1130-2-18, Preparation of Operational Management Plan at Civil Works Water Resources Projects.

g. Executive Order 12962, Recreational Fisheries, 7 June 1995.

4. Procedures.

In most water years it will not be possible to hold both reservoir levels and river stages at a steady or rising level for the entire spawning period, especially when upstream reservoirs and/or the Apalachicola River spawning periods overlap. Droughts and floods within the basin also present specific water management challenges. During the spawning period applicable to each water body (paragraph 4(b)), the Corps shall operate for generally stable or rising reservoir levels , in accordance with the guidance of DR 1130-2-16, 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. When these management goals are not possible, impose an unreasonable compromise to other project purposes, or would conflict with other fish management concerns within the basin, the Corps shall consult with the State fishery agencies and the FWS on balancing needs within the system and minimizing the impacts of fluctuating reservoir or river levels. Modifications to fish spawn operations could include readjusting the base elevation for fish spawn operation purposes at a particular project, allowing a rapid lowering in elevation back to the base elevation or a readjusted elevation following a flood event, or other operational adjustments recommended by the interagency team to minimize impacts and/or enhance system-wide benefits. The Corps shall also consult with the State fishery agencies and the FWS on water management operations that would minimize fishery impacts and balance needs throughout the system for the remaining portions of the fish spawn periods. The Corps shall schedule management responsibilities that conflict with operating for stable or rising reservoir levels or relatively stable river stages outside the fish spawning period to the extent practicable, consistent with other applicable laws and regulations.

a. In February of each year Mobile District staff representatives will meet with the fisheries biologists from Alabama, Florida, Georgia, Mississippi and the FWS to discuss projected spring and summer trends, anticipated hydrological conditions within the basin, success of the past year's fish spawn, and ways to balance fisheries priorities between reservoir and river systems during the upcoming spawning season. An imbalance of prey and forage fish could occur following the second or third year of poor or unsuccessful spawning and recruitment, leading to poor sport fishing. Areas where the spawns were recently unsuccessful should be given higher priority for fish management operations under low water conditions.

b. The periods during which the Corps shall operate to achieve the purposes of this SOP are as follows:

Administrative Office	Project/Water Body	Principal Fish Spawning Period for Operational Consideration
ACF PROJ MGMT OFFICE	Walter F. George Lake	15 March – 15 May
	Lake Seminole	01 March – 01 May
	Apalachicola River	01 April – 01 June
ALLATOONA PROJ MGMT OFFICE	Allatoona Lake	15 March – 15 May
LANIER PROJ MGMT OFFICE	Lake Sidney Lanier	01 April – 01 June
OKATIBBEE PROJ MGMT OFFICE	Okatibbee Lake	01 April – 01 June
WEST POINT PROJ MGMT OFFICE	West Point Lake	01 April – 01 June

c. Project personnel shall contact local State fisheries management personnel responsible for their project areas prior to the initiation of the identified spawning period and keep in close contact with them throughout the spawning period. PD-EI shall contact and maintain coordination with the State of Florida fisheries management personnel regarding initiation and status of fish spawning on the Apalachicola River. Information regarding the actual progress of fish spawn (i.e., has started, is in progress, is in peak, or has ended) should be relayed by project personnel to the Mobile District Office through OP-TR, and reported to EN-HW and PD–EI during the weekly water management meetings.

d. EN-HW will consider hydrologic conditions within the basin, recommendations from the State fisheries management agencies and FWS, and status of fish spawn at other locations within the basin to schedule fish spawn operations for each project area (reservoir or river system) within the basin. The goal will be to provide generally stable or rising levels on the reservoirs and/or generally stable or gradually declining river stages on the Apalachicola River for approximately 4 to 6 weeks during the spawning period identified for each water body. Efforts to minimize fishery impacts and balance fishery resource and other project needs within the basin during the remaining portions of the spawning periods will also consider recommendations from the State fishery management agencies and FWS. A summary of the status of fish spawn operations at each project (including date and elevation at initiation and completion of fish spawn operations) will be posted on the Mobile District Water Management website.

e. EN-HW will notify the PA office when fish spawning season begins and will invite PA to specific weekly water management meetings when important decisions having public impact are likely to be made. PA will advise the news media within 24 hours of notification of any specific water management actions that are potentially detrimental to the fish spawn, including an explanation of the reasons for the water management actions.

f. OP-TR will maintain an updated list of State and FWS fisheries biologists for the lake and river projects. OP-TR personnel will attend weekly water management meetings during the spawning period, relay pertinent information relating to the status of fish spawn or other fish management concerns to EN-HW, PD-EI and PA, and send weekly, either by e-mail or telephone, water conditions data to appropriate State and FWS fisheries personnel. OP-TR and PD-EI will consult telephonically with State and FWS fisheries personnel as necessary, and include project personnel in the consultation as appropriate. Any significant decisions based on the weekly water management meetings will also be relayed telephonically or by email to State fisheries personnel, FWS, project personnel, and South Atlantic Division personnel by OP-TR. PD-EI will advise any environmental groups or other interested stakeholder groups of the proposed action. At the conclusion of the spawning period, OP-TR will forward a summary report of the annual fish spawn operations to State fisheries management agencies, FWS, and South Atlantic Division, with a copy to PD-EI.

g. OP-TR, EN-HW, PD-EI and PA will coordinate directly with each other or call additional meetings as the need arises.

Date _______________

PETER F. TAYLOR, JR.
Colonel, Corps of Engineers
Commanding

DISTRIBUTION: B

Enclosure 12

Memorandum for Record
Annual Fish Management Coordination Meeting
20 February 2003

CESAM-PD-EI 3 March 2003

MEMORANDUM FOR RECORD

SUBJECT: Proposed Update/Revision to SAM SOP 1130-2-9, Lake Regulation and Coordination for Fish Management Purposes – Interagency Meeting on 20 February 2003

1. On 20 February, representatives of the U.S. Army Corps of Engineers met at the Lake Seminole Resource Management Office with representatives of the U.S. Fish and Wildlife Service and the State fish management agencies from Georgia and Florida for further discussions related to the proposed update and revision of the current SOP for reservoir operations during fish spawn periods. Representative from the Alabama fish management agency were also invited, but were apparently unable to attend. The focus of previous discussions was to consider the inclusion of management of reservoir operations to minimize fish spawning impacts on the Apalachicola River. It was also recommended that set fish spawn periods be established for each project area, which would consider a number of fish species other than just large-mouth bass, which was the management target species for the current SOP. It had also been proposed to discontinue temperature monitoring for determining when fish spawn begins. A revised draft Strawman SOP (attached) was circulated to the agencies for review prior to this meeting, which incorporated language related to the above recommendations, along with comparison of previous spawning operations periods determined by temperature monitoring with the proposed spawning periods (attached). Also attached is an updated copy of the Agency Point of Contract list for coordination during the fish spawn season, which incorporates POCs for Lake Okatibbee in addition to Allatoona Lake and the ACF projects. The following representatives were present and participated in the meeting discussions.

Jerry Ziewitz	U.S. Fish and Wildlife Service (USFWS)
Rick Long	Florida Fish and Wildlife Conservation Commission (FWCC)
Ted Hoehn	FWCC
Charlie Mesing	FWCC
Rob Weller	Georgia Dept. of Natural Resources (GDNR), WRD, Albany
Russ Ober	GDNR, WRD, Albany
Brent Hess	GDNR, West Point Lake
Les Brusse	USACE, Lake Seminole
Don Morgan	USACE, Lake Seminole
Tim Rainey	USACE, Mobile District, OP-TR
Ken Day	USACE, Mobile District, OP-TR
Memphis Vaughan	USACE, Mobile District, EN-HW
Joanne Brandt	USACE, Mobile District, PD-EI

2. Ted Hoehn expressed concern that the 4 to 6 weeks of fish spawn operations referenced in the SOP was not long enough to provide for successful spawning for a number of species in the river. Joanne explained that the 4 to 6 weeks was consistent with the guidance of the South Atlantic Division (SAD) regulation (DR 1130-2-16). That would be the extent of time for which

the Mobile District would be committed to maintain stable conditions on the reservoir and/or river in most years. It would not be possible to include the river and also maintain stable conditions on each of the reservoirs for the entire 8 week periods suggested by the agencies, unless water is plentiful throughout the basin and no flood pulses occur, etc. However, the SOP describes a coordination protocol for consideration of fish management operations for the entire proposed fish spawn period, and Mobile District would coordinate with the State POCs to determine if alternative operations could be conducted that would minimize fishery impacts for the remaining period.

3. Jerry Ziewitz noted that it was unrealistic to expect the water operators to be able to maintain a stable elevation on the Apalachicola River for the proposed 1 April to 1 June spawning period, since the normal hydrological conditions during that period would be a gradual decline in river stages due to reduced inflows into the basin. The main concern from a fishery management perspective would be to avoid any precipitous drop in river stages during that period. FWCC agreed that a gradual decline, with no drop greater than 6 inches per day, would be acceptable to them. Jerry agreed to draft alternative language that would provide for a gradual decline and no drop greater than 6 inches – language would be related to natural inflows and greater drop may be experienced if low inflow are experienced and reservoirs are also declining. The proposed alternate language would reference that reservoir storage during the spawning period would be increased only when river flows can also be met. Jerry also noted that dips in river elevation toward the end of the spawning period are more damaging than earlier in the period, due to more established spawning for more species later in the season. Joanne expressed concern whether the proposed later spawning period (1 April – 1 June) would be inconsistent with efforts to manage flows for Gulf sturgeon which would spawn from early March through early April. He indicated that there are generally higher flows in March when the sturgeon begins spawning, and that gradually declining stages in April should not be harmful to the Gulf sturgeon spawning. Joanne indicated that the Corps would prepare some form of documentation of informal consultation regarding anticipated impacts to the sturgeon to satisfy Section 7 consultation requirements.

4. Joanne asked if the proposed dates for the spawning period at Allatoona Lake (15 March – 15 May) should be re-evaluated in light of the review of the historic periods for fish management determined by temperature monitoring. Review of the temperature data showed that spawning operations historically began in early to mid-April and extended until late May to early June. Russ Ober agreed to check with their field biologist on the appropriate dates for a proposed spawning period for Allatoona Lake. (Note: In follow-on communications Russ confirmed the 15 March – 15 May dates, but noted if only a 6 week period could be obtained, then the project should be operated to maintain stable conditions during the period 21 Mar – 7 May. The Georgia fishery biologists are primarily interested in enhancing the crappie spawn, which occurs prior to the bass spawn.)

5. Possible fish spawn operations during spring of 2003 were also discussed. Both West Point Lake and Apalachicola River proposed fish spawn periods would run during 1 April – 1 June. Walter F. George fish spawn period would run 15 Mar – 15 May. If water is in short supply this spring, it is likely that water from Walter F. George would have to be released to support fish

spawning activities on the Apalachicola River. GDNR agreed that up to a 1 foot drop could be experienced this year on Walter F. George Lake, if necessary, to support flows on the river. This option would be coordinated in advance with the State fishery biologists in order to attempt to minimize impacts throughout the basin.

6. It was agreed to circulate another draft Strawman proposal that would incorporate alternative language specifying operations that would provide for stable or gradually declining stages on the Apalachicola River. USFWS will provide proposed alternate language. It was also generally agreed that fish management operations consistent with the draft Strawman SOP would be conducted on a demonstration basis for this year to see how effectively the proposed protocol worked. We would operate this year under the auspices of an alternate annual plan, which is provided for in the Division Regulation (DR 1130-2-16). The proposed revision to the SOP would likely be formally approved at a later date. Joanne noted that SAD was considering a modification to the division regulation that would be consistent with our proposal to institute established fish spawn periods in place of those established via temperature monitoring. In the meantime, we will continue to collect temperature data this year.

7. On a related matter, FWCC requested if the Mobile District could consider altering spillgate operations at Jim Woodruff Dam to provide for opening of gates near the powerhouse during peak fishing periods of April – May. Don Morgan agreed to check into this possibility and requested the FWCC coordinate directly with him on this matter. Also, Russ Ober expressed concern that the fishing pier and other fishing access areas immediately below Walter F. George had been closed off due to security reasons since 11 Sept 01. He asked if there could be consideration to increasing limited access to these fishing areas. He was advised that security at the Corps facilities was still a high priority, and it was unlikely that it would be relaxed in the near future.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Enclosures
1. Draft Strawman proposal with edits
2. Temperature monitoring data vs. proposed spawning periods
3. Updated POC list

Copies Furnished:
USFWS/Carmody/Ziewitz/Jenkins/Goldman/Tucker/Palmer/Aycock/Sinclair/
GDNR/Ober/Weller/Hess/Probst/Weaver/Durniak/Ager/Evans/Partridge/
FWCC/Hoehn/Mesing/Long/Estes/Yeager
ADCNR/Hornsby/McHugh/Rider/Newman/Nichols

MDWFP/Holman
CESAM-OP-T/Anderson
CESAM-OP-TR/Day/Rainey
CESAM-OP-TN/Bradley/Dyess
CESAM-OP-TH/Cromartie
CESAM-OP-GE/Jangula
CESAM-OP-OL/Huntley
CESAM-OP-AL/Petersen
CESAM-OP-SL/Topper/Taylor
CESAM-OP-WP/Sosebee/Treherne/Chitwood
CESAM-OP-AC/Earnest
CESAM-OP-AC-WFG/Puhr
CESAM-OP-AC-LS/Brusse/Bond/Morgan
CESAM-EN-HW/Vaughan/Morisani
CESAM-PD-E/McClellan
CESAM-PD-EI/Findley/Peck/Eubanks
CESAD-CM-OC/Davis
CESAD-DM-PE/Mauldin

Enclosure 13

Memorandum for Record
Annual Fish Management Coordination Meeting
12 February 2004

CESAM-PD-EI 17 February 2004
(Revised 12 Mar 04)

MEMORANDUM FOR RECORD

SUBJECT: Annual Coordination Meeting, Reservoir Water Management Operations in Support of Fish Management, 12 February 2004, Bainbridge, Georgia

1. On 12 February 2004, representatives of the U.S. Army Corps of Engineers, Mobile District (CESAM) and South Atlantic Division (CESAD), attended the Annual Coordination Meeting with representatives of the U.S. Fish and Wildlife Service (USFWS); Alabama Department of Conservation and Natural Resources, Wildlife and Freshwater Fisheries (AW&FF); Florida Fish and Wildlife Conservation Commission (FFWCC); and Georgia Department of Natural Resources, Wildlife Resources Division (GA-DNR-WRD). The purpose of the Annual Coordination Meeting is to discuss priorities for reservoir operations in support of fish spawning activities for the upcoming spring. The Annual Coordination Meeting is included as a requirement in the draft revision to SAM SOP 1130-2-9. A copy of the agenda for the meeting is attached. The following representatives participated in the meeting discussions.

Name	Agency	Phone	Email Address
Jerry Ziewitz	USFWS	850-769-0552, X-223	Jerry_Ziewitz@fws.gov
Mike Newman	AW&FF	334-347-9467	dist6@alaweb.com
Nick Nichols	AW&FF	334-242-3883	nnichols@dcnr.state.al.us
Chris Greene	AW&FF	334-252-3628	cgreene@dcnr.state.al.us
Rick Long	FFWCC	850-487-1645	eric.long@fwc.state.fl.us
Ted Hoehn	FFWCC	850-488-6661	ted.hoehn@fwx.state.fl.us
Charlie Mesing	FFWCC	850-487-1645	Charles.Mesing@fwc.state.fl.us
Brent Hess	GA-DNR-WRD	706-845-4180	Brent_Hess@dnr.state.ga.us
Russ Ober	GA-DNR-WRD	229-430-4256	russ_ober@mail.dnr.state.ga.us
Rob Weller	GA-DNR-WRD	229-430-4256	Rob_Weller@mail.dnr.ga.us
Gary Mauldin	CESAD	404-562-5232	gary.v.maudlin@usace.army.mil
Jerry Fulton	CESAM	770-945-9531	gerald.p.fulton@sam.usace.army.mil
Don Morgan	CESAM	229-662-2001	don.m.morgan@usace.army.mil
Leslie W. Brusse	CESAM	229-662-2001	leslie.w.brusse@usace.army.mil
Joanne Brandt	CESAM	251-690-3260	joanne.u.brandt@sam.usace.army.mil
Matt Lang	CESAM	251-694-3837	matthew.j.lang@sam.usace.army.mil
Memphis Vaughan	CESAM	251-690-2730	memphis.Vaughan.jr@sam.usace.army.mil
Cheryl Hrabovsky	CESAM	251-694-4018	cheryl.l.hrabovsky@sam.usace.army.mil
Amber Houston	CESAM	251-694-4397	Amber.M.Houston@sam.usace.army.mil

2. Non-Water Management Operations at Corps reservoirs. The purpose of this annual coordination meeting is to address reservoir water management operations in support of fish management. However, Jerry Fulton of the Lake Lanier Resource Office noted that there are a number of other fish management efforts and concerns that could also be addressed in this or a

similar forum in order to improve coordination and communications on what we are doing with the State fishery agencies. For instance, the Corps currents releases water from sluice gates at Buford Dam to improve DO and other water quality parameters in release waters downstream for the trout hatchery and fishery on the Chattahoochee River below the dam. There are also actions underway at Buford Dam to improve DO (i.e., turbine venting) so that routine sluice releases can be reduced or discontinued. Jerry also noted that there are over 600 fishing tournaments that occur annually on Lake Lanier, and suggested that it may useful to establish a coordination protocol with the State fishery agency on timing and locations of fish tournaments to reduce possible overfishing/mortality rates or possible other use conflicts. Russ Ober requested that the State fishery agencies be included in planning decisions related to any future closures of public use areas on the Corps reservoirs. Brent Hess also noted that the recent flood debris clean-up activities being completed by a Corps contractor had removed much shoreline fishery habitat; and that earlier coordination with his agency could have provided recommendations for minimizing and/or mitigating impacts to fishery habitat as part of the contract. Some woody material is now being replaced along the shoreline to compensate for impacts to shoreline habitat. Consideration will be given to the appropriate forum or means to incorporate State agency coordination in these other fish and wildlife management operations.

3. <u>Background and Summary of 2003 Fish Spawn Operations</u>. Joanne Brandt gave a summary of previous efforts to update the Mobile District SOP to improve coordination during fish spawn operations, to include the Apalachicola River in the SOP operations, and to establish an Annual Coordination Meeting to plan for the upcoming year's fish spawning operations. Hydrographs were presented to demonstrate the resulting lake levels and river stages produced by a combination of the Corps management actions and the atypically wet season experienced in 2003. During much of the fish spawn operations period, most of the lakes were above the rule curve and water management efforts were directed at flood control operations and attempts to return the lake levels to as close to the rule curve as possible. Apalachicola River stages were maintained at or above a 9-foot Blountstown gage, but with many flood pulses reaching between 18 to 20 feet on the gage during the fish spawn operation period. (Copy of presentation slides attached.)

Most fishery agency staff were pleased with the resulting operations, and anticipate that 2003 was a very good spawn year at the lakes and on the Apalachicola River due to the sustained high water levels. Sampling data to be gathered in the next few weeks will be able to confirm whether this was the case. There were a couple of incidents following flood pulses on Walter F. George Lake that resulted in more significant drawdown than would have been preferred by Georgia fisheries staff, but levels were maintained at or above188.5 and above the rule curve for the entire period. Priorities for water management operations during the 2003 operations period were fish management and flood control; with head limits considerations influencing water management decisions in a few cases. Memphis Vaughan presented summary data on ramping rates experienced on the Apalachicola River in 2003, and discussed several factors that may at times influence or hinder the Corps' ability to meet target drawdown and ramping rates during fish management operations.

These factors include: head limits at Jim Woodruff Dam and the upstream reservoirs (George W. Andrews Dam and Walter F. George Dam); limited storage at JWD; the water level in the upstream reservoirs; travel time for releases from WFG; manually operated gates at JWD that require personnel to be called up at night for changes in releases; rainfall forecasts; and forecasted Flint River flows. (Copy of presentation slides attached).

4. Outlook for 2004 Fish Management Operations. Hydrological indications for 2004 are that it will be a normal to wet spring. January was a very dry month, but recent rainfall within the District in February is putting the lakes in pretty good shape for beginning fish spawn operations. We will continue to closely monitor the hydrological conditions throughout the spawning operations period, as conditions could become drier later this spring. No special priorities for management decisions (e.g. reservoir versus river management priorities) were recommended by the fishery agencies for 2004, based on relatively good spawning conditions during 2003 throughout the ACF basin, and in the other reservoirs.

5. Recommendations for Fish Management Operations in 2004. Jerry Ziewitz presented some graphs that demonstrated the relationship between river stage on the Apalachicola River versus the quantity of spawning habitat available. Below approximately 12,000 to 14,000 cfs flow, almost all of the fish spawning habitat is limited to the river channel itself. Above this flow, increasingly more adjacent floodplain habitat becomes available for spawning. (Copy of presentation slides attached.) Jerry proposed that during periods when water is plentiful within the ACF basin (i.e., reservoirs are at or above the rule curve), that attempts be made to augment flows on the Apalachicola River to maintain minimum flows/stages that would enhance the quantity of spawning habitat available on the river for a minimum 30-day period. Any fall in river stage would eliminate successful spawning at elevations above the lowest stage experienced during the 30-day period. USFWS and FWCC recommended that releases be maintained at a minimum of 18,000 cfs for the month of April (equivalent to an approximate 8-foot Blountstown gage); and a minimum of 14,000 for the month of May (equivalent to an approximate 6-foot Blountstown gage), based on historical hydrological conditions and the floodplain/stage relationship. Jerry noted that this goal should not be obtained at the expense of the reservoirs and that the reservoir levels should not be lowered to achieve this goal; but water could be released to bring the reservoirs to the rule curve and/or to temporarily delay filling by maintaining stable rather than rising reservoir levels. Memphis noted that this may be possible during wetter conditions, but not if we have dry periods or would risk being able to refill the reservoirs. Memphis will investigate ways to determine whether normal to wet conditions are sufficient to allow support of a minimum flow on the Apalachicola River during the spawning operation period. Possible indicators could include total basin inflow; action zones at Lake Lanier, West Point Lake and Walter F. George Lake; average daily inflow by month. It was agreed to try to manage for these minimum river stages in 2004, if hydrological conditions allow, and to coordinate with USFWS and FWCC on alternative lower stages in the event the recommended river stages cannot be maintained.

The proposed fish spawn operations period for Walter F. George Lake recommended by GA-DNR-WRD and included in the draft SOP is 15 Mar – 15 May. AW&FF recommended that operations be scheduled as early in that period as possible, since fish spawn typically occurs earlier in the shallow water areas located on the Alabama side of the lake.

The proposed fish spawn operations period for West Point Lake is 01 April – 01 June. GA-DNR-WRD recommends that operations be scheduled as early in April as possible.

Memphis noted that keeping the staggered operations periods as they are is preferable to scheduling several to occur at the same time, due to possible conflicts with competing water management goals on a system-wide basis. Efforts would likely be directed to complete fish spawn operations as soon as possible on Lake Seminole and Walter F. George Lake so that there will be more flexibility in managing for river stages on the Apalachicola River.

Jerry Fulton noted that at Lake Lanier, releases in support of DO levels on the Chattahoochee River below Buford Dam would likely have higher priority over any releases to maintain river levels in support of fish spawn on the Chattahoochee River. Such actions would be coordinated with the GA-DNR-WRD staff responsible for Lake Lanier.

Coordination during 2004 will include the above recommendations as much as possible. Weekly updates will be forwarded to the agency POCs following the weekly Wednesday water management meetings. In the event there are conditions that would deviate from the management goals or alternative operations are proposed due to possible conflicts with other project purposes, then email or telephone coordination will be completed with the appropriate fish management agencies in accordance with the language in the draft revision to the SOP.

The Corps' water management website home page contains a link to a table containing information on the status of fish spawn operations. This table will be updated for the 2004 fish spawn operations. [The website address is: http://www.sam.usace.army.mil/; click on Water Levels; and then click on Fish Spawn Status.]

6. Recommendations for Final Language in Revised SOP. The revised SOP must be approved at the South Atlantic Division Office before it can be finalized and formally implemented. CESAD had recommended consideration of a revision to the Division Regulation rather than granting a waiver to approve the Mobile District SOP (a waiver would be required to eliminate temperature monitoring as the determiner of the fish spawn operation period rather than operating during established timeframes). Mobile District had consulted with Savannah District, who prefers to maintain their operations based on temperature monitoring. Therefore, Gary Mauldin said that CESAM will likely approve the SOP under a waiver. Joanne suggested a change in wording as discussed during the 2003 annual coordination meeting, which would define the river management goal of providing relatively stable or gradually declining river stages (no more than ½ foot drop per

day), as distinguished from the reservoir goal of providing stable or rising lake levels (no more than ½ foot drawdown during the fish spawn operations period). USFWS agreed the proposed change in wording would be appropriate.

A copy of the proposed final draft language for the revised SOP is attached. Agency comments should be provided NLT than 1 March 2004. The revised SOP would then be finalized and forwarded to CESAD for approval.

7. Update to Agency POC s for 2004. Attached is the updated POC list which will be used for agency coordination during 2004. Any additional updates or changes should be provided to Mobile District as soon as possible. Mobile District POC for agency coordination during fish spawn operations is Matt Lang, (251) 694-3837, Email: matthew.j.lang@sam.usace.army.mil.

/s/

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Enclosures
Agenda
3 Presentations (Brandt/Vaughan/Ziewitz)
Updated POC list
Revised Draft SOP 1130-2-9

Copies furnished:
Jerry Ziewitz/Gail Carmody/USFWS/Panama City, FL
Alice Palmer/Sandra Tucker/USFWS/Athens, GA
Larry Goldman/USFWS/Daphne, AL
Ray Aycock/USFWS/Jackson, MS
Mike Newman/Nick Nichols/Chris Greene/Damon Abernethy/Jon Hornsby/AW&FF
Rick Long/Ted Hoehn/Charlie Mesing/FFWCC
Brent Hess/Russ Ober/Rob Weller/Wayne Probst/Reggie Weaver/Jeff Durniak/Les Ager/David Partridge/GA-DNR-WRD
Gary Mauldin/CESAD-CM-PE
Chris Smith/CESAD-MT-E
Jonathon Davis/CESAD-CM-OC
Jerry Fulton/Pat Taylor/Irwin Topper/CESAM-OP-SL
Don Morgan/Bill Bond/Les Brusse/CESAM-OP-LS
Eddie Sosebee/Ron Puhr/CESAM-OP-AC-WFG
Mike Treherne/Bob Chitwood/CESAM-OP-WP
Eric Petersen/CESAM-OP-AL
Jack Huntley/CESAM-OP-OL

Memphis Vaughan/Cheryl Hrabovsky/Bob Allen/Charlie Yanny/Amber Houston/ CESAM-EN-HW
Matt Lang/Diane Findley/CESAM-PD-EI
Ken Day/CESAM-OP-TR
John Anderson/CESAM-OP-T
Paul Bradley/CESAM-OP-TN
Carl Dyess/CESAM-OP-D
Terry Jangula/CESAM-OP-GE
Leon Cromartie/CESAM-OP-TH
Pat Robbins/CESAM-DX
Janet Shelby/CESAM-PA

Annual Coordination Meeting
Reservoir Operations in Support of Fish Management
12 February 2004
1:00 p.m. EST

AGENDA

Introductions

Background on Proposed Revision/Update to Mobile District SOP

Summary of Fish Spawn Operations in 2003

Outlook for 2004

Anticipated Hydrological Conditions

Fish Management Concerns

Recommendations for Fish Management Operations in 2004

Recommendations for Final Language in Revised SOP

Update Agency POCs for 2004

Other Discussion ???

ADJOURN

Enclosure 14

Memorandum for Record
Annual Fish Management Coordination Meeting
15 February 2005

CESAM-PD-EI 17 February 2005

MEMORANDUM FOR RECORD

SUBJECT: 2005 Annual Fish Spawn/Fish Management Coordination Meeting

1. On 15 February 2005, representatives of the U.S. Army Corps of Engineers (USACE), Mobile District, met with representatives of the U.S. Fish and Wildlife Service (USFWS), Alabama Department of Conservation and Natural Resources (ADCNR), Florida Fish and Wildlife Conservation Commission (FWCC), and Georgia Department of Natural Resources (GA-DNR) to review the results of water management operations in support of fish spawning activities in 2004, the current status of hydrological conditions in the Apalachicola, Chattahoochee, Flint (ACF) river basins, and projected climatological and hydrological conditions that should be considered to assist in making recommendations for water management operations in support of fish spawning activities in 2005. Another purpose of the meeting was to finalize the coordination and operations protocols for incorporation into SAM SOP 1130-2-9. The following representatives participated in the annual coordination meeting:

Damon Abernethy, ADCNR, (334) 358-0035, dabernethy@dcnr.state.al.us
Ted Hoehn, FWCC, (850) 488-6661, ted.hoehn@myFWC.com
Rick Long, FWCC, (850) 487-1645, eric.long@myFWC.com
Charles Mesing, FWCC, (850) 487-1645, charles.mesing@myFWC.com
Ramun Martin, GA-DNR, (229) 430-4256, ramun_martin@dnr.state.ga.us
Rob Weller, GA-DNR, (229) 430-4250, rob_weller@mail.dnr.state.ga.us
Brent Hess, GA-DNR, (706) 845-4180, brent_hess@mail.dnr.state.ga.us
Jerry Ziewitz, USFWS, Panama City, FL (850) 769-0552, Ext.-223, jerry_ziewitz@fws.gov
Alice Lawrence, USFWS, Athens, GA, (706) 613-9493, Ext. 222, alice_lawrence@fws.gov
Gary Mauldin, USACE, South Atlantic Division, Water Mgt., (404) 562-5232, gary.v.mauldin@usace.army.mil
Eddie Sosebee, USACE-West Point Lake Operations Project Mgr.,(706) 645-2937, ralph.e.sosebee.jr@sam.usace.army.mil
Bill Smallwood, USACE-ACF Operations Project Mgr., (229) 768-2516, william.l.smallwood@sam.usace.army.mil
Bill Bond, USACE-Lake Seminole, (229) 662-2001, william.j.bond@sam.usace.army.mil
Don Morgan, USACE-Lake Seminole (229)662-2001, don.m.morgan@sam.usace.army.mil
Ken Day, USACE-Mobile, Res Mgt., Operations Div., (251) 694-3724, kenneth.day@sam.usace.army.mil
Bo Ansley, USACE-Mobile, Prog. Mgt., Operations Div., (251) 694-3726, hubert.r.ansley@sam.usace.army.mil
Marilyn Phipps, USACE-Mobile, PublicAffairs, (251) 690-2506, marilyn.j.phipps@sam.usace.army.mil
Gene Morisani, USACE-Mobile, Water Mgt., (251)690-3385, eugene.a.morisani@sam.usace.army.mil
Cheryl Hrabovsky, USACE-Mobile, Water Mgt., (251) 90694-4018, cheryl.l.hrabovsky@sam.usace.army.mil
Rob Erhardt, USACE-Mobile, Meterologist, (251) 690-3384, robert.d.erhardt.jr@sam.usace.army.mil
Memphis Vaughan, USACE-Mobile, Water Mgt., (251) 690-2730, memphis.vaughan.jr@sam.usace.army.mil
Joanne Brandt, USACE-Mobile, Planning & Environ, (251) 690-3260, joanne.u.brandt@sam.usace.army.mil

A copy of the draft agenda for the meeting discussions is enclosed.

2. Summary of 2004 Fish Spawn Operations. Cheryl Hrabovsky and Gene Morisani gave a summary of 2004 operations in support of fish spawning activities on the ACF. A copy of their presentation slides is attached. For Lake Lanier/Buford Dam and West Point Lake fish spawn operations extended from 1 April through 1 June, and stable or gradually rising elevations were maintained throughout the period. Lake levels approximated the rule curve during refill of the lakes for the fish spawn operations period. For Walter F. George Lake fish spawn operations

were maintained for an extended period from 15 March through 4 June and lake elevations were maintained between elevations 188 and 189 except for a day or so. Concerns had been raised by GA-DNR to maintain stages above 188 and close to 189 in order to maintain inundation of vegetated shorelines during spawn operations. Lake Seminole/Jim Woodruff fish spawn operations were maintained from 4 March through 8 April and maintained elevations within a 6-inch range around elevation 177. Fluctuations in Lake Seminole were primarily due to inflows from the Flint River and releases necessary to maintain downstream river stages. Fish Spawn operations for the Apalachicola River were maintained from 15 March through 21 June, with approximately 5 weeks of stable stages, and then gradually declining stages for the remainder of the extended period. Inflows into the ACF basin were 37, 36 and 50 percent of normal, respectively for the months of March, April and May. We were not able to provide river stages sufficient to inundate large areas of important fish habitat, and portions of Gulf sturgeon spawning habitat were not fully submerged during fish spawn operations period due to extremely low inflows in the basin during the driest March on record. In consultation with the U.S. Fish and Wildlife Service, a system of monitoring basin inflows over a 3-day average, and then managing to release at least the basin inflows was developed to assure that Apalachicola River fisheries were supported with at least the basin inflows into the system. The graph showing comparison of basin inflows with releases from Jim Woodruff Dam shows several periods from late March through early June when releases to the Apalachicola River were augmenting flows above the basin inflows. Flows on the river were maintained above 7000 cfs except for a couple of days at approximately 6500 cfs.

3. Outlook for 2005 Hydrological/Climatological Conditions. Gene provided the current hydrological conditions for 2005 and the 4-week projections for lake levels and river stages at the projects within the ACF system. The 4-week projection shows what we expect to see in early to mid-March. Lake levels at Lake Lanier, West Point Lake and Walter F. George are projected to be at or near the rule curve for top of conservation. Lake Seminole (Jim Woodruff) is projected to be at approximate elevation 77. It is anticipated we will be able to maintain the Apalachicola River at or above an 8 to 9-foot Blountstown gage. All of these projections are subject to change during the fish spawn period depending upon the amount of rainfall that is received in the basin.

Rob Erhardt provided a summary of the climatological conditions within the southeastern United States and the river basins within Mobile District. In 2004 we experienced moderate drought conditions during the spring months, the driest March on record and one of the hottest on record. These extremely dry conditions extended into the month of April 2004. We have to date experienced very similar condition for the months of January and February 2005 to those experienced in January and February 2004. However, there are not drought conditions forecast for the southeastern states for 2005. It would be a very rare event to experience another spring as dry as 2004.

4. Recommendations for Fish Spawn Operations in 2005. The group then discussed recommendations for fish spawn operations in Spring 2005. In general, it is better to have sufficient river flows to support fish spawning early in the year, and allow for lower river stages later in the summer to fall months. However, it was agreed that this should not be at expense of conserving storage in the upstream reservoirs which can be used to augment flows throughout the remaining months and in support of other authorized project purposes. In the event of low flows this spring, it was agreed to continue to implement the system of providing releases from Jim Woodruff that meet or exceed the average basin inflows. During last year's coordination meeting, USFWS and FWCC indicated that a minimum of 18,000 cfs flow would be required to

support Apalachicola River spawning, although approximately 21,000 cfs would be required to fully inundate the sturgeon spawning habitat (rock ledge) immediately below Jim Woodruff Dam. Jerry Ziewitz noted this would still be the desired flow. The projected 8- to 9-foot Blountstown gage would provide the minimum 18,000 cfs flow. The Corps will make attempts to provide the 8- to 9-foot stage as long as possible, depending upon inflows into the basin. During any low flow conditions during the designated fish spawn periods when this cannot be accomplished, the Corps will consult via telephone conferences and/or email coordination with the U.S. Fish and Wildlife Service and the appropriate State agency representatives to assist in making appropriate water management decisions in support of fish spawning. FWCC expressed concern that the upstream reservoirs be maintained as close to the top of conservation as possible rather than holding levels above the conservation pool, in order to provide sufficient or a “fair share” of flows to the river. Memphis and Gene assured that was the desired practice, but it normally will take a few days to bring the reservoir levels back to the rule curve after a substantial rain event, and the practice is to gradually lower back to the top of conservation while making beneficial use of the water captured in the reservoir. Beneficial use can mean use for other project purposes (e.g., hydropower), or to maintain more stable river stages by controlling releases, etc. When operating to balance releases from Jim Woodruff with basin inflows during low flow conditions, upstream reservoirs will generally be kept at a stable level, while river stages are stable and/or gradually falling – depending on the available inflows.

5. Recommendations for Final Language in Revised SAM SOP 1130-2-9. A copy of the latest draft SAM SOP 1130-2-9 was distributed to the group (copy attached). This draft maintains the substance of the previous drafts but has been reformatted and provides for minor changes in the internal coordination within the Corps. The SOP outlines goals for fish spawn management, agency coordination requirements and designates a 2-month period for each project during which water management operations in support of fish spawn will be implemented for a minimum of 4- to 6-weeks. The goal is to provide stable or gradually rising levels on the lake projects, and stable or gradually declining river stages on the Apalachicola River. It was requested that final agency comments be provided on this draft version. The agencies confirmed the dates for each project spawning periods. Brent Hess concurred with the dates for West Point Lake (1 April – 1 June), but recommended that the management period be scheduled to begin early in April whenever possible. Charlie Mesing suggested that the SOP be modified to allow the upstream reservoirs to be lowered up to 1 foot instead of the 6 inches currently stated as the current SOP language. However, it was generally agreed that the 6-inch goal should be maintained in the SOP, with the understanding that the agencies could recommend an alternative management scheme as necessary during annual coordination discussions or the agency consultation teleconference discussions. It was intended to forward the draft SOP to South Atlantic Division for approval prior to the initiation of fish spawn management activities this spring. However, due to ongoing litigation filed by the States of Alabama and Florida, and references to fish spawn management activities and the SOP in the recent litigation complaint filed by the State of Florida, final approval of the SOP may be deferred pending receipt of approval to proceed from the Department of Justice and/or the judge in the U.S. District Court.

6. Other Fish Management Activities.

a. Alice Lawrence and Jerry Ziewitz noted they were looking a the peaking operations and impacts on fish spawning on the Etowah River below Allatoona Dam. They would like to work with the Corps to develop a plan for providing relatively stable river levels for an approximately 2-week period during spawning, by either eliminating power peaking altogether; generating through the house unit or releasing a minimum flow through one of the turbine units. Memphis noted that we would probably be able to work something out to accommodate those needs.

b. GA-DNR noted that they are working in partnership with US Fish and Wildlife Service to fund a fish passage study this spring at Jim Woodruff Lock. Dr. Isley will be performing the study under contract, and will monitor movements of Alabama shad, striped bass and Gulf sturgeon within the lock. Fish will be tagged with sonar tags and movements will be monitored by hydrophones placed within the lock chamber. The Corps has been working with Dr. Isley in placement of the hydrophones and monitoring equipment, and will assist in monitoring data output, etc. The study will be conducted during the month of March and possibly extending into April to include monitoring of Gulf sturgeon movements.

c. The Corps has participated with the USFWS in the mapping of available hard bottom habitat areas in the upper 20 miles of the Apalachicola River which may be utilized by Gulf sturgeon for spawning. We are currently relating the location and depth of the habitat areas to flow stages to determine the amount of habitat available various flow stages. The Corps also purchased 15 radio tags that were placed by USFWS on mature Gulf sturgeon during the fall of 2004. It is planned to monitor migratory movements of the sturgeon this spring, and also monitor movements to spawning habitat areas. Egg mats will be placed at potential spawning habitat areas where sturgeon have been tracked to monitor for use and/or spawning success.

7. Attempts will be made to schedule the 2006 Annual Coordination Meeting in conjunction with the February Morone Workshop. The next Morone workshop will be held on 7-8 February 2006 in Apalachicola Florida.

Enclosures

JOANNE BRANDT
Biologist
Inland Environment Team

Enclosure 15

Memorandum for Record
Annual Fish Management Coordination Meeting
7 February 2006

CESAM-PD-EI 21-February-2006

MEMORANDUM FOR RECORD

SUBJECT: 2006 Annual Fish Spawn/Fish Management Coordination Meeting

1. On 7 February 2006, representatives of the U.S. Army Corps of Engineers (USACE), Mobile District, met with representatives of the U.S. Fish and Wildlife Service (USFWS), Alabama Department of Conservation and Natural Resources (ADCNR), Florida Fish and Wildlife Conservation Commission (FWCC), and Georgia Department of Natural Resources (GA-DNR) to review the results of water management operations in support of fish spawning activities in 2005. Other topics discussed were the current status of hydrological conditions in the Apalachicola, Chattahoochee, Flint (ACF) river basins, and projected climatological and hydrologic conditions that should be considered to assist in making recommendations for water management operations in support of fish spawning activities in 2006. Another purpose of the meeting was to solicit suggestions on balancing fisheries priorities between reservoir and river systems during the upcoming spawning season based on recent spawn outcomes. The following representatives participated in the annual coordination meeting:

Rick Long, FWCC Midway, (850) 487-1645, eric.long@myFWC.com
Ramon Martin, GA-DNR Albany, (229) 430-4256, ramon_martin@dnr.state.ga.us
Rob Weller, GA-DNR Albany, (229) 430-4250, rob_weller@dnr.state.ga.us
Jerry Ziewitz, USFWS, Panama City, FL (850) 769-0552, Ext.-223, jerry_ziewitz@fws.gov
Gail Carmody, USFWS, Panama City, FL (850) 769-0552, Ext.-225, gail_carmody@fws.gov
Karen Herrington, USFWS, Panama City, FL (850) 769-0552, Ext.-250, Karen_Herrington@fws.gov
Tom Sinclair, USFWS, Atlanta, GA (404)-679-7324, thomas_sinclair@fws.gov
Steve Herrington, TNC, Bristol, FL (850) 643-2756, sherrington@tnc.org
Nick Nichols, AL-DCNR Montgomery, (334) 242-3471, nick.nichols@dcnr.alabama.gov
Bill Stark, AL-DCNR Montgomery, (334) 683-4596, bill.stark@dcnr.alabama.gov
Dan Tonsmeire, Apalachicola Riverkeeper, (850)-653-8936, dan@abark.org
Matthew Lang, USACE-Mobile, Planning & Environ. (251)694-3837, matthew.j.lang@sam.usace.army.mil
Ken Day, USACE-Mobile, Res Mgt., Operations Div., (251) 694-3724, kenneth.day@sam.usace.army.mil
Cheryl Hrabovsky, USACE-Mobile, Water Mgt., (251) 694-4018, cheryl.l.hrabovsky@sam.usace.army.mil

2. Summary of 2005 Fish Spawn Operations. Cheryl Hrabovsky and Matt Lang began the discussions regarding fish spawn operations in 2005 in the ACF basin. A copy of our presentation slides is attached. For Lake Lanier/Buford Dam spawn operations were delayed until 4/20/05 due to an early spring flood on 3/27/05, and were concluded on 5/31/05. The minimum 4 week spawn window was extended an additional 11 days. West Point Lake fish spawn operations were conducted from 4/12/05 through 5/31/05. Again operations were delayed due to early spring floods at the end of March, and stable or gradually rising elevations were maintained throughout the period. Spawn operations

began on 3/22/05 at Walter F. George Lake but were halted due to an early spring flood on 3/27/05, and were reinitiated on 4/12/05 and ran through the end of May (5/31/05). Fish spawn operations were maintained for an extended period, a total of 6 weeks. The above lake levels approximated the rule curve during refill of the lakes for the fish spawn operations period. Levels were drawn down after rain events to the approximate rule curve elevation. Levels in Lake Lanier and Walter F. George Lake fell below the rule curve later in the spawn season, as lake levels remained steady due to use of storage to augment downstream flows. Lake Seminole/Jim Woodruff fish spawn operations began on 3/9/05 but were halted due to the spring flood on 3/27/05. Operations were reinitiated on 4/12/05 and were completed on 5/13/05. A total of 7 weeks were completed for Lake Seminole (3 weeks before the 3/27 flood, and 4 weeks after). Fluctuations in Lake Seminole were primarily due to inflows from the Flint River and releases necessary to maintain downstream river stages. Fish Spawn operations for the Apalachicola River was delayed until 4/20/05 due to the flood event on 3/27/05. Fish spawn operations were maintained through 5/31/05, with approximately 5 weeks of stable or gradually declining stages. Due to declining basin inflows in May and concern that releases could fall below the recommended flows to support the threatened Gulf sturgeon, Mobile District initiated informal consultation with USFWS and the FWCC on 11 May 2005. In these consultation discussions, it was agreed to implement the low flow operations protocol developed during consultations on low flow conditions in 2004. This operations protocol consists of monitoring basin inflows over a 3-day average, and then managing to release at least the basin inflows, and was developed to assure that Apalachicola River fisheries were supported with at least the basin inflows into the system. Gradual step downs in releases were based on declines in the computed basin inflow, and the timing and rate of the stepdown in flows was reached collaboratively between USFWS and the Mobile District. The graph showing comparison of basin inflows with releases from Jim Woodruff Dam shows results of our operations during the fish spawn period; and in particular the attempts to provide at least basin inflows during the month of May when inflows fell below 20,000 cfs. In the latter part of May, releases to the Apalachicola River were augmenting flows above the basin inflows.

3. Summary of Pool and River Elevations for 2005. Cheryl provided graphical representations of the pool and river elevations for our 2005 Fish Spawn Management Operations. The graphs showed the pool elevations for the 8 week spawn period as an expression of their relation to the top of conservation for each reservoir.

4. Summary of basin Inflows and Outflows for 2005. Cheryl explained the average normal basin inflows and what percentage the basin actually received in 2005. Cheryl also had a graphical representation of inflows for the entire basin and also the outflows from Jim Woodruff Lock & Dam (JWLD). The two lines plotted across the same relative course throughout the graphs period (3/1/05 to 6/30/05). Cheryl then explained that the ACF has seen approximately 98% of normal basin inflows for January 2006.

5. Outlook for 2006 Hydrological/Climatological Conditions. Cheryl discussed the projected climatological conditions for 2006, as provided by our meteorologist Rob Erhardt. Rob provided Cheryl with a summary of the climatological conditions within

the southeastern United States and the river basins within Mobile District. In 2005 we experienced above average rainfall conditions during the spring months. We also experienced high rainfall amounts in the summer months due to the extremely active hurricane season of 2005. We have to date experienced very similar conditions for the month of January 2006 to those experienced in January 2005. However, there are mild drought conditions forecast for the southeastern states for 2006. We are however expecting another active hurricane season for 2006. Dr. William Gray from The National Hurricane Center has forecasted that there will be 17 named storms, 9 hurricanes with 5 being intense (category 3-5).

6. Recommendations for 2006 operations. Cheryl made mention that the operations folks at Lake Seminole have raised concerns about the operation of the gates at JWLD as it relates to the ½ foot step down on the Apalachicola River. The gates are currently being held open at a ½ of a step with the aide of a crane that is placed on the spillway. The concern rises from the use of the cranes and their evident wear and tear. Also, if the crane were to malfunction, the remainder of the spillway would be, in effect, cut-off and would make repair to the crane and gate a very daunting task. Suggestions were made that the possibility could arise that the hydropower generators at the dam could be used to augment the minimum flows needed downstream in the river. Jerry Ziewitz, from USFWS, said that he would be willing to help in the determination of whether or not this operational plan would suffice in our water management needs on the Apalachicola River. We also stated that we would operate under the same operating conditions as last year, per our Draft SOP 1130-2-9, and continue to consult with the USFWS and the states regarding low flow conditions.

Enclosures

MATTHEW J. LANG
Biologist
Inland Environment Team

Summary of

Fish Spawn Operation

for 2005

Fish Spawn Operation Dates

Allatoona Lake	15 March - 15 May
Okatibbee Lake (MS.)	01 April – 01 June
Lake Sidney Lanier (Buford)	01 April – 01 June
West Point Lake	01 April – 01 June
Lake Eufaula (W. F. George)	15 March – 15 May
Lake Seminole (Woodruff)	01 March - 01 May
Apalachicola River (FL.)	01 April – 01 June

2005 Fish Spawn Operations

Project	Window	Start/End Dates
Allatoona Lake	15 March - 15May	20 April – 31 May
Okatibbee Lake	01 April - 01 June	25 April - 31 May
Lake Lanier	01 April - 01 June	20 April - 31 May
West Point	01 April - 01 June	12 April - 31 May
Walter F. George	15 March - 15 May	12 April - 31 May
Lake Seminole	01 March - 01 May	12 April – 13 May
Apalachicola River	01 April - 01 June	20 April - 31 May

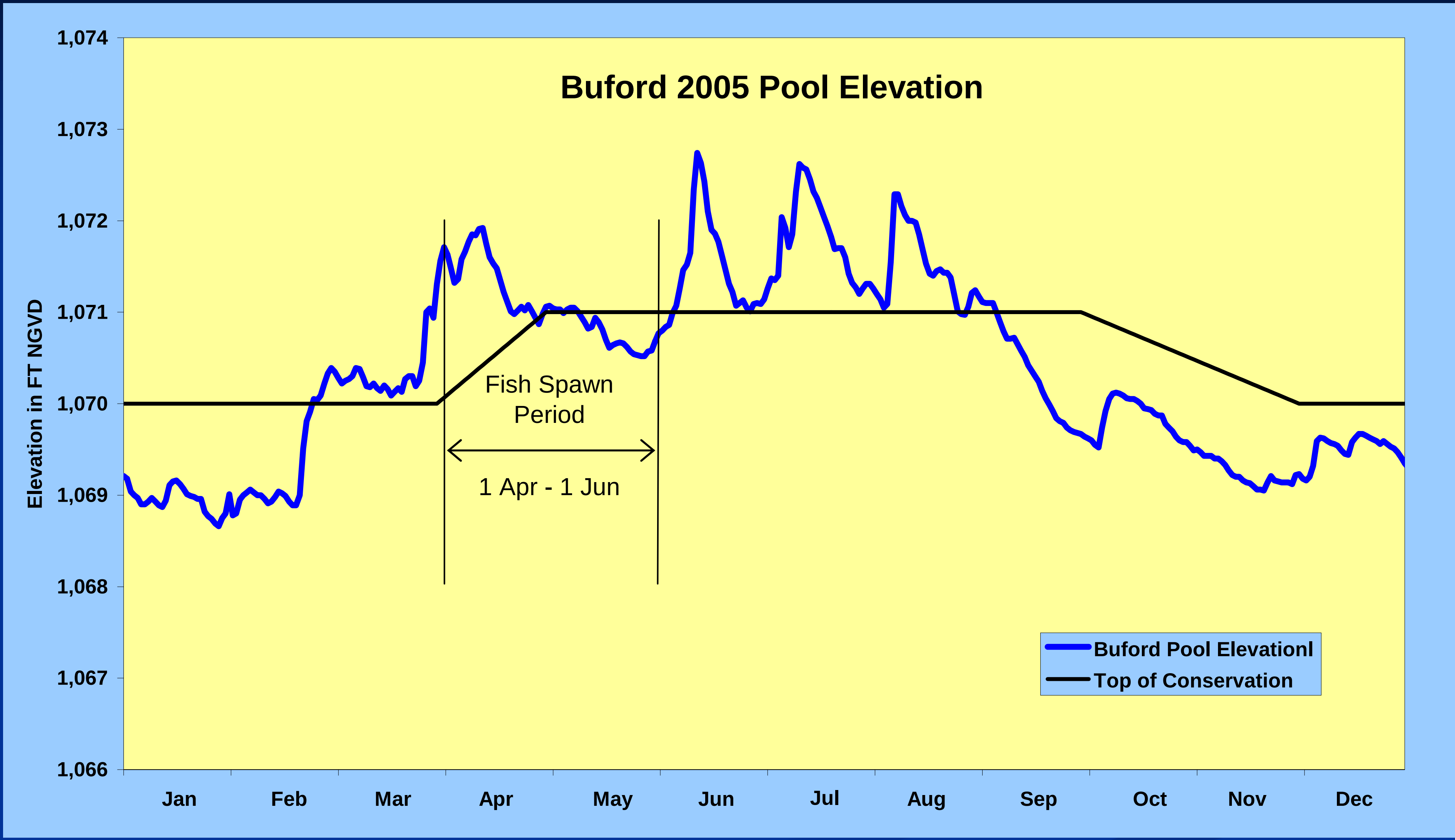
2005 Fish Spawn Operations

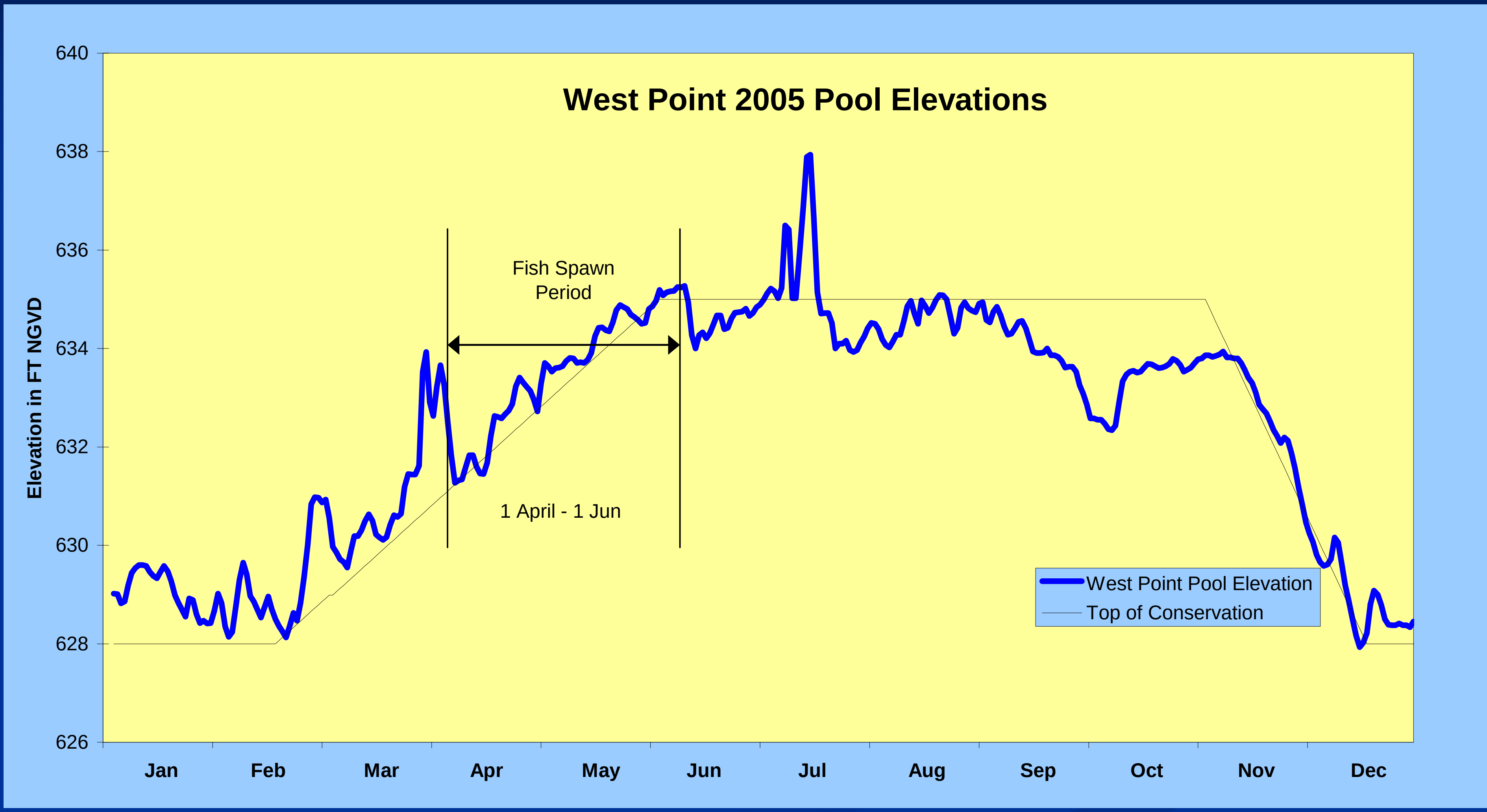
- Start dates were delayed due to early Spring floods in 2005
- The Corps met the 4 week minimum as stated in Draft SOP 1130-2-9, and extended longer where possible
- Weekly updates and coordination provided by email correspondence
- Corps, USFWS, & State Fisheries agencies all took part in telephone consultations to voice concerns and suggestions

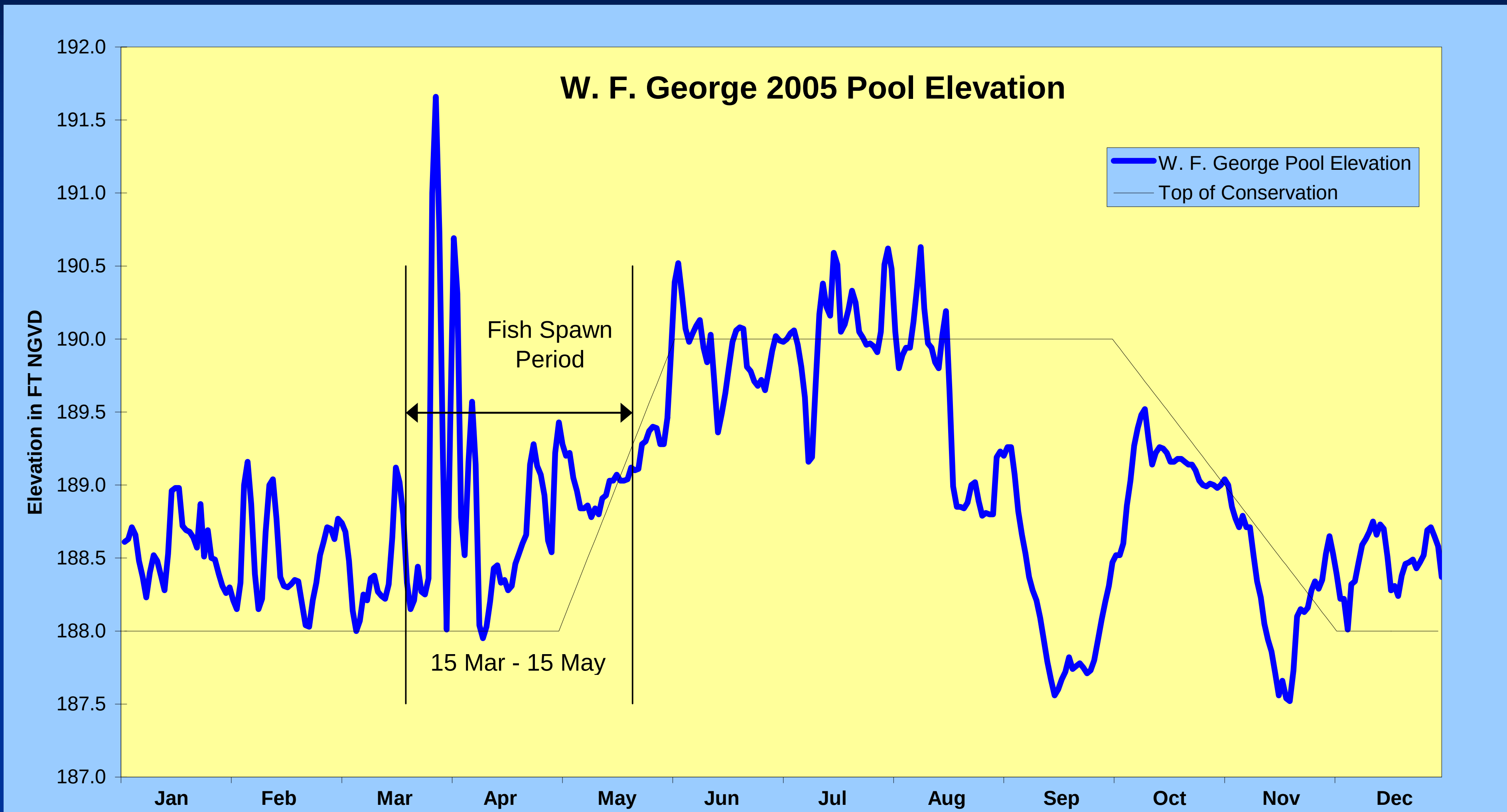
Summary of

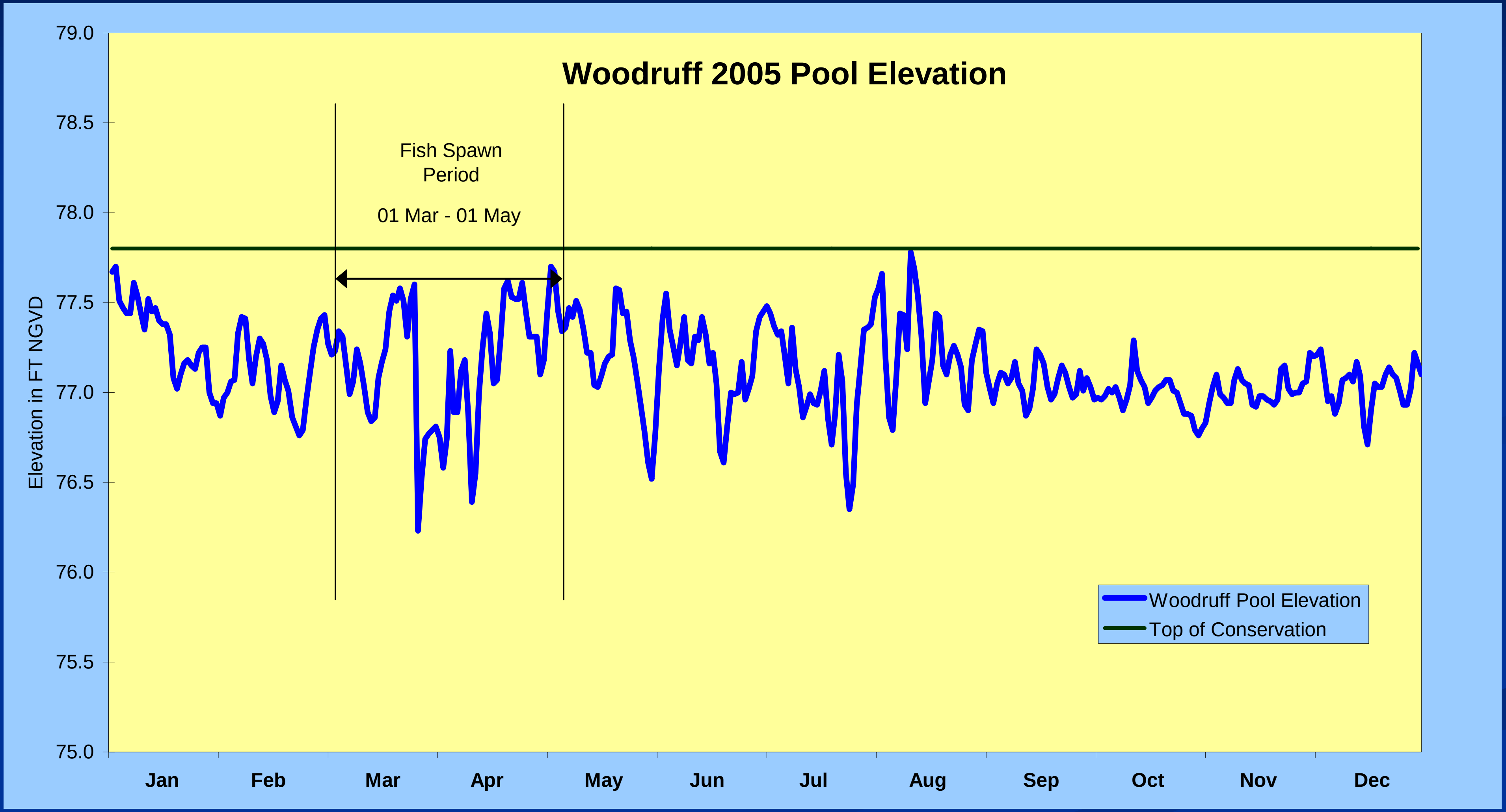
Pool and River Elevations

for 2005

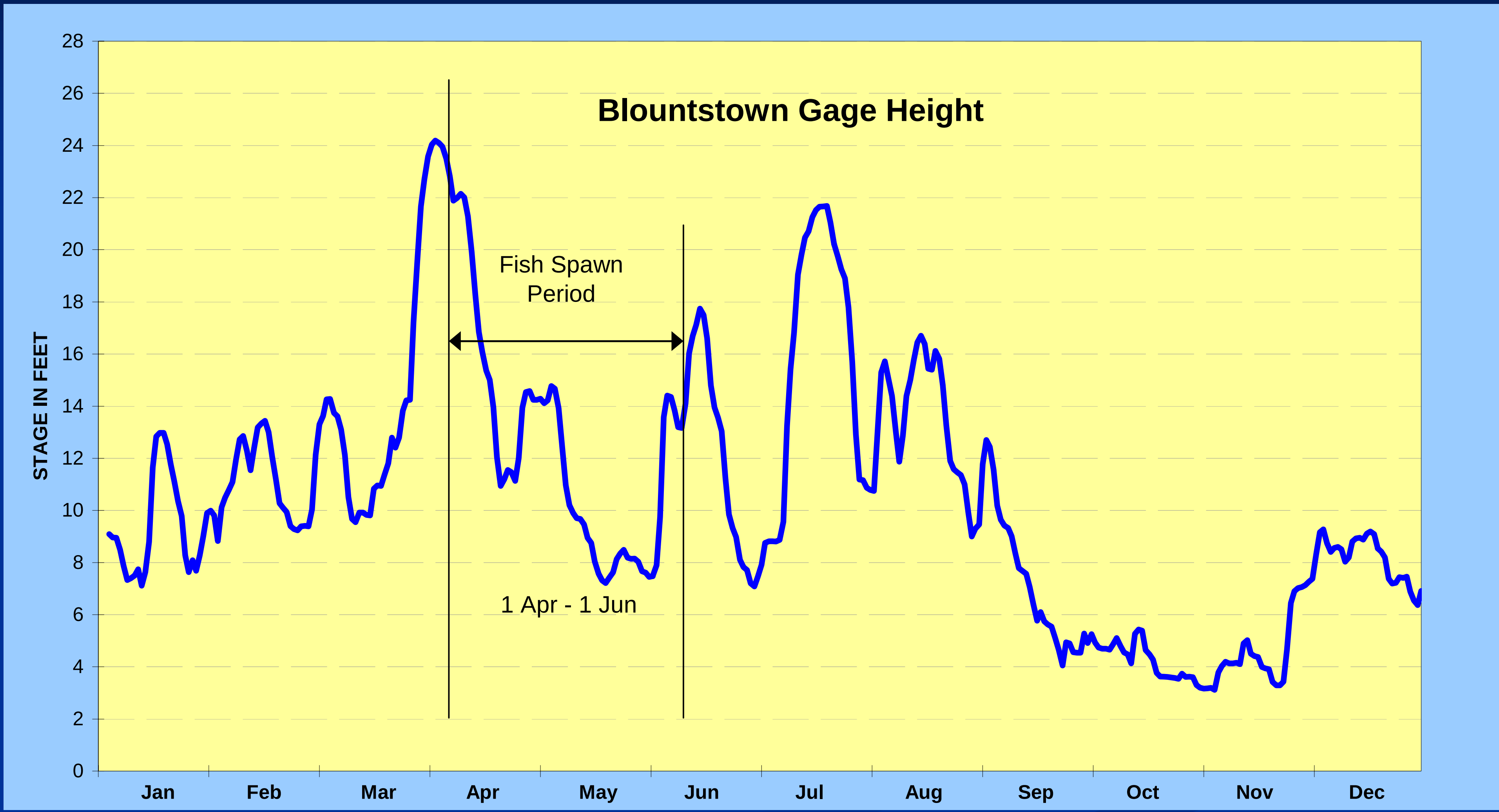

Buford 2005 Pool Elevation
1,074
1,073
1,072
1,071
1,070
1,069
1,068
1,067
1,066
Elevation in FT NGVD
Fish Spawn
Period
1 Apr - 1 Jun
Buford Pool Elevationl
Top of Conservation
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


West Point 2005 Pool Elevations
Elevation in FT NGVD
640
638
636
634
632
630
628
626
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Fish Spawn Period
1 April - 1 Jun
West Point Pool Elevation
Top of Conservation

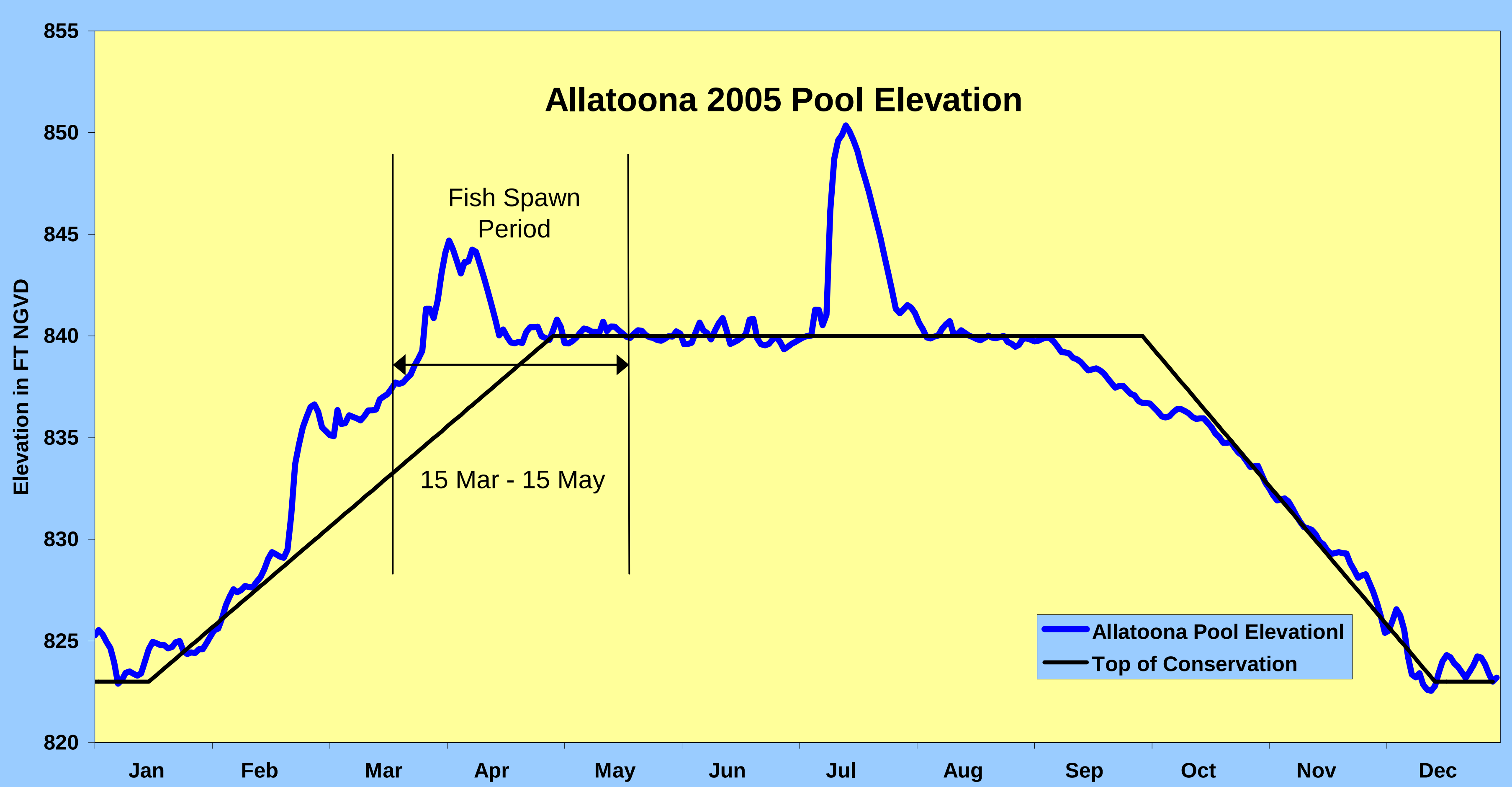

W. F. George 2005 Pool Elevation
W. F. George Pool Elevation
Top of Conservation
Fish Spawn Period
15 Mar - 15 May
Elevation in FT NGVD
192.0
191.5
191.0
190.5
190.0
189.5
189.0
188.5
188.0
187.5
187.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec



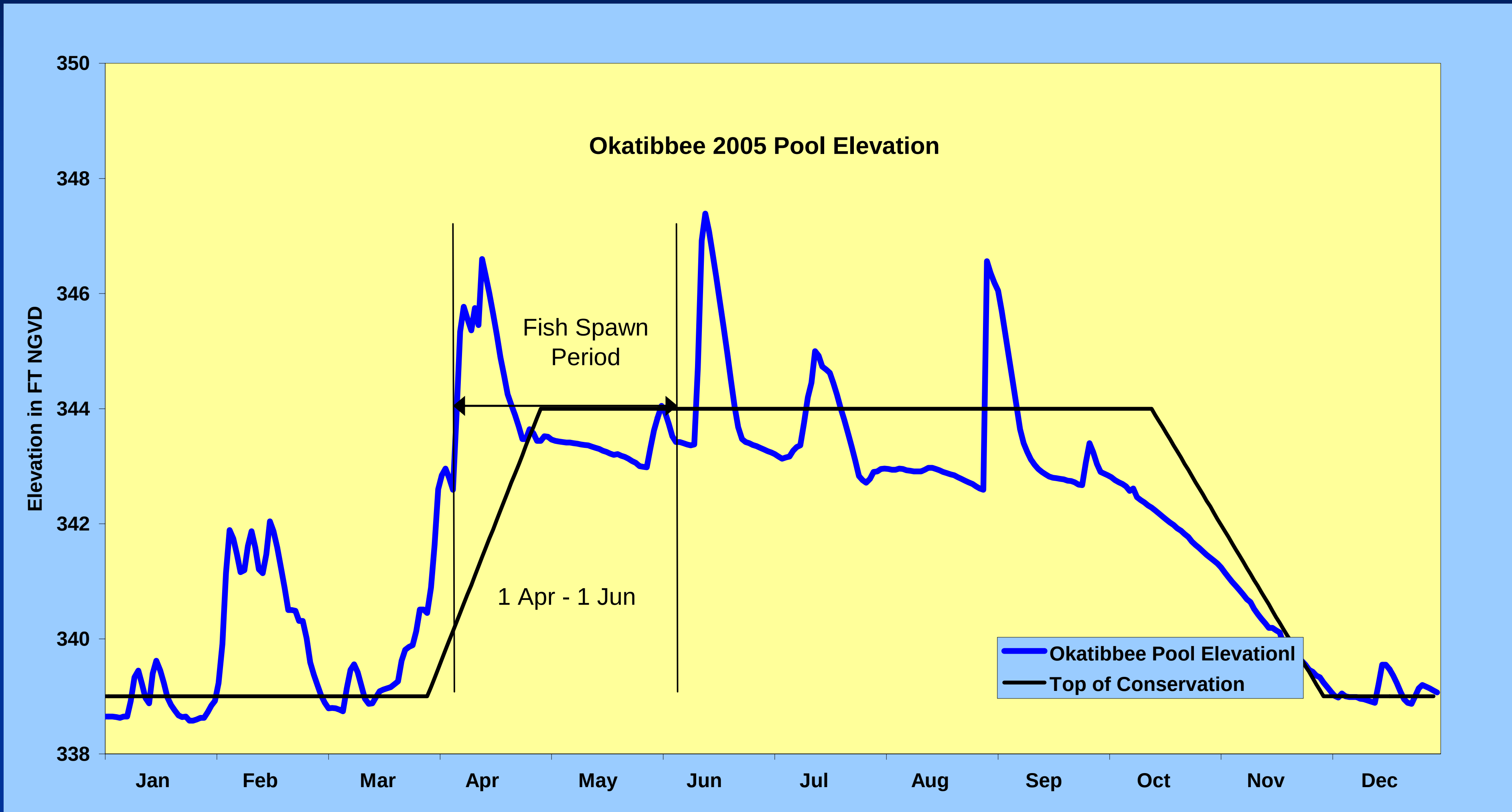
Woodruff 2005 Pool Elevation
Elevation in FT NGVD
79.0
78.5
78.0
77.5
77.0
76.5
76.0
75.5
75.0
Fish Spawn
Period
01 Mar - 01 May
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Woodruff Pool Elevation
Top of Conservation



Blountstown Gage Height
STAGE IN FEET
28
26
24
22
20
18
16
14
12
10
8
6
4
2
0
Fish Spawn
Period
1 Apr - 1 Jun
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec



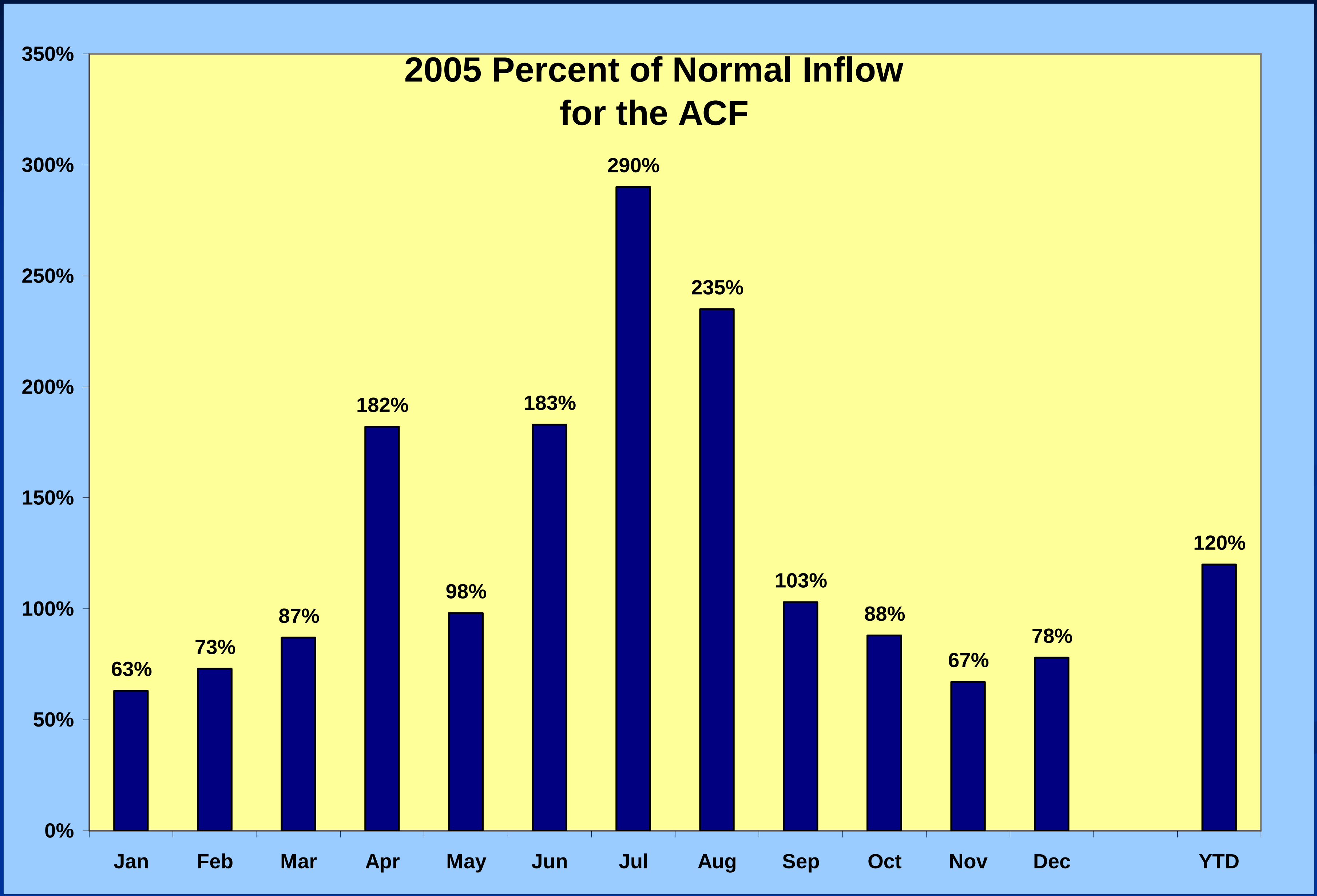
Allatoona 2005 Pool Elevation
Elevation in FT NGVD
855
850
845
840
835
830
825
820
Fish Spawn Period
15 Mar - 15 May
Allatoona Pool Elevationl
Top of Conservation
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec

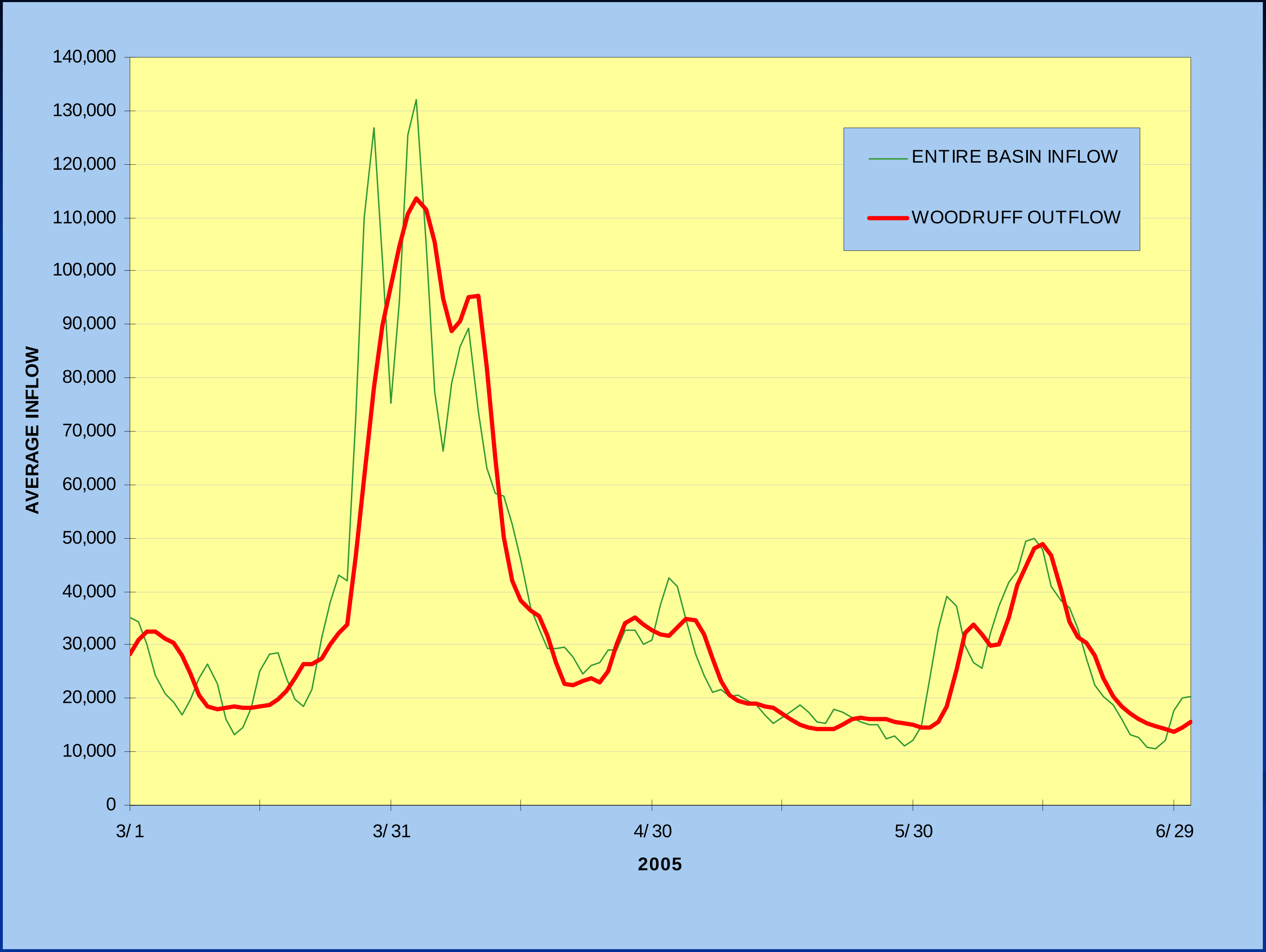


Okatibbee 2005 Pool Elevation
Elevation in FT NGVD
350
348
346
344
342
340
338
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Fish Spawn Period
1 Apr - 1 Jun
Okatibbee Pool Elevationl
Top of Conservation

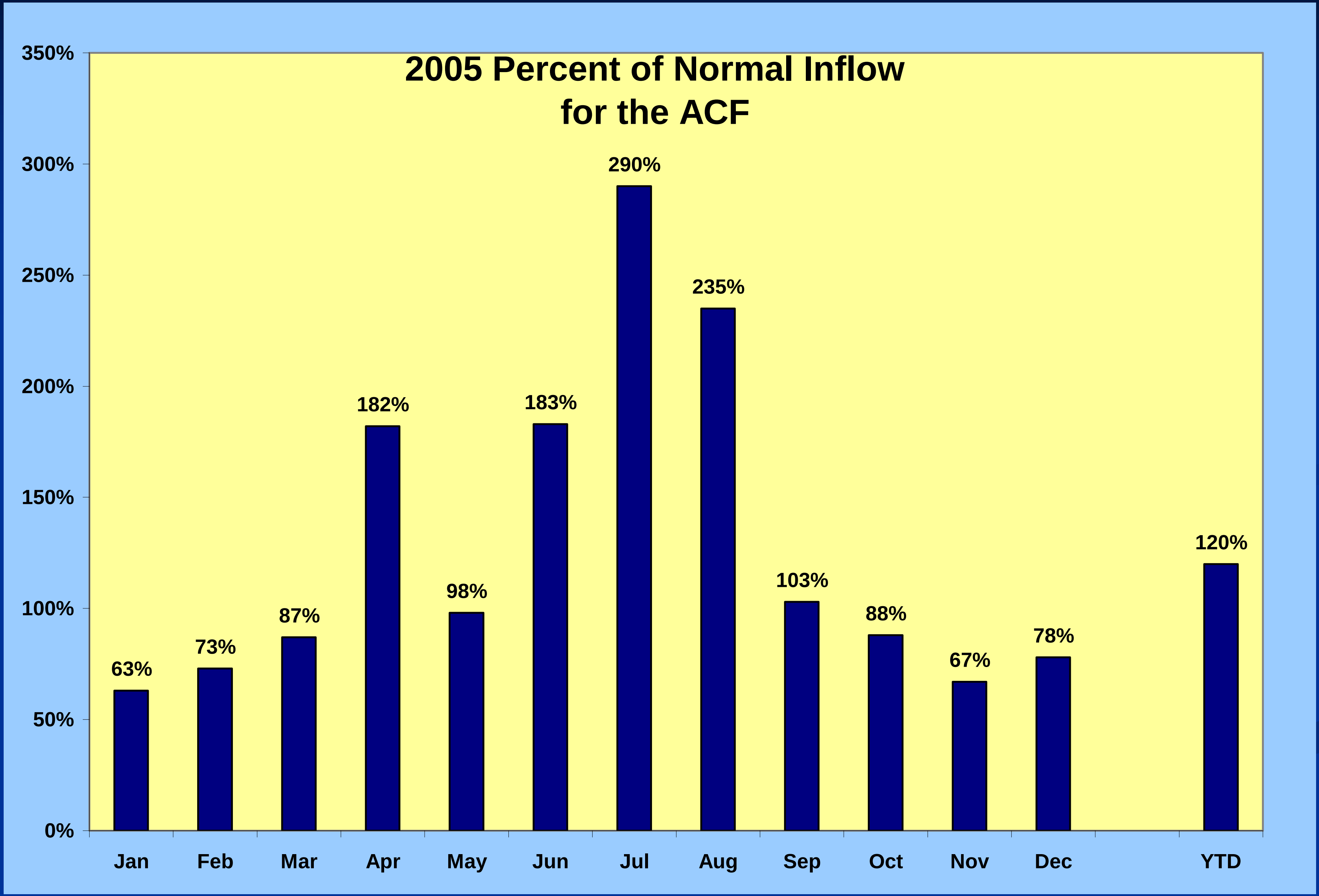
Summary of

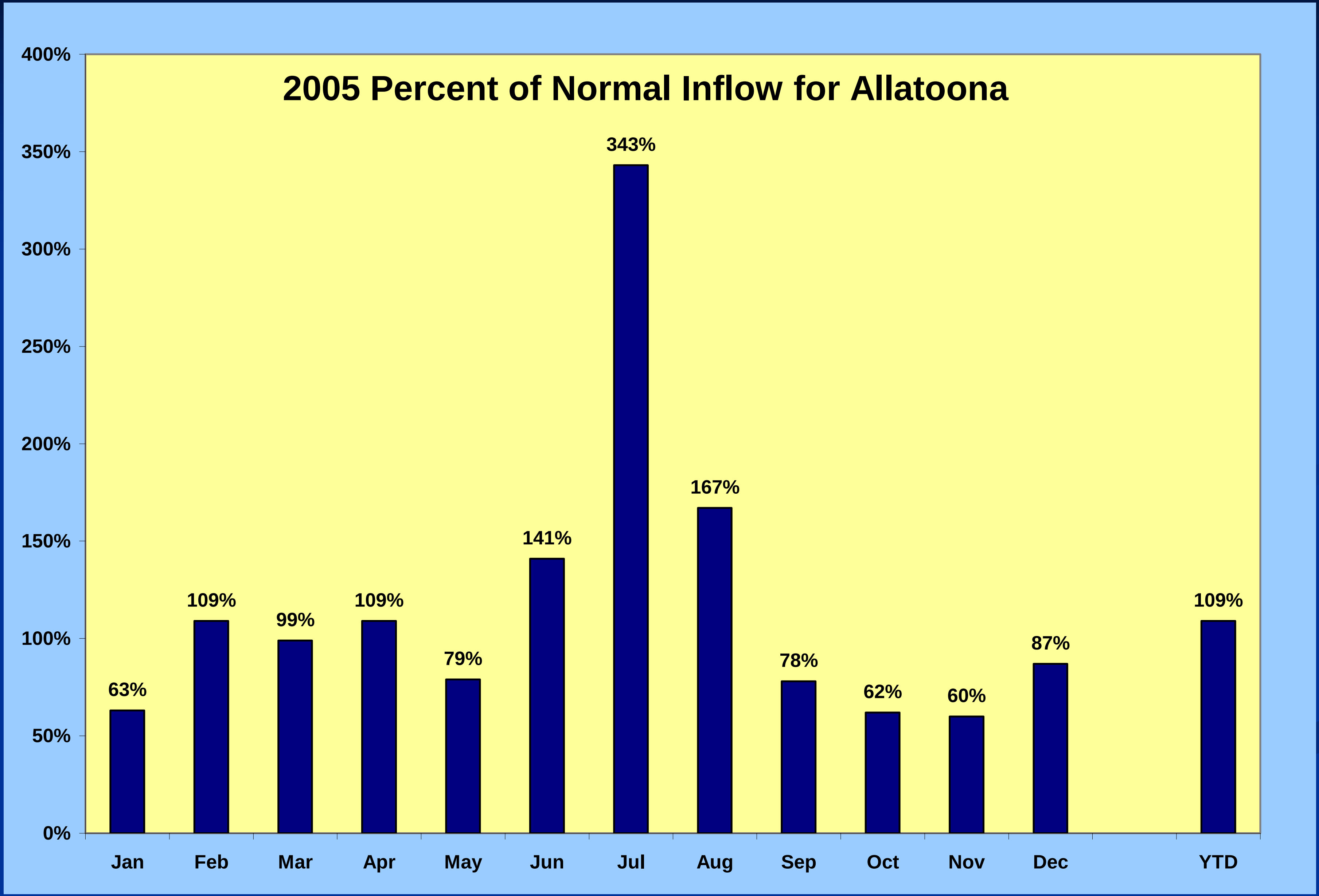
Basin Inflows and Outflows for 2005


2005 Percent of Normal Inflow
for the ACF
350%
300%
250%
200%
150%
100%
50%
0%
63%
73%
87%
182%
98%
183%
290%
235%
103%
88%
67%
78%
120%
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
YTD



140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
AVERAGE INFLOW
3/ 1
3/ 31
4/ 30
5/ 30
6/ 29
2005
ENTIRE BASIN INFLOW
WOODRUFF OUTFLOW


2005 Percent of Normal Inflow
for the ACF
350%
300%
250%
200%
150%
100%
50%
0%
63%
73%
87%
182%
98%
183%
290%
235%
103%
88%
67%
78%
120%
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
YTD

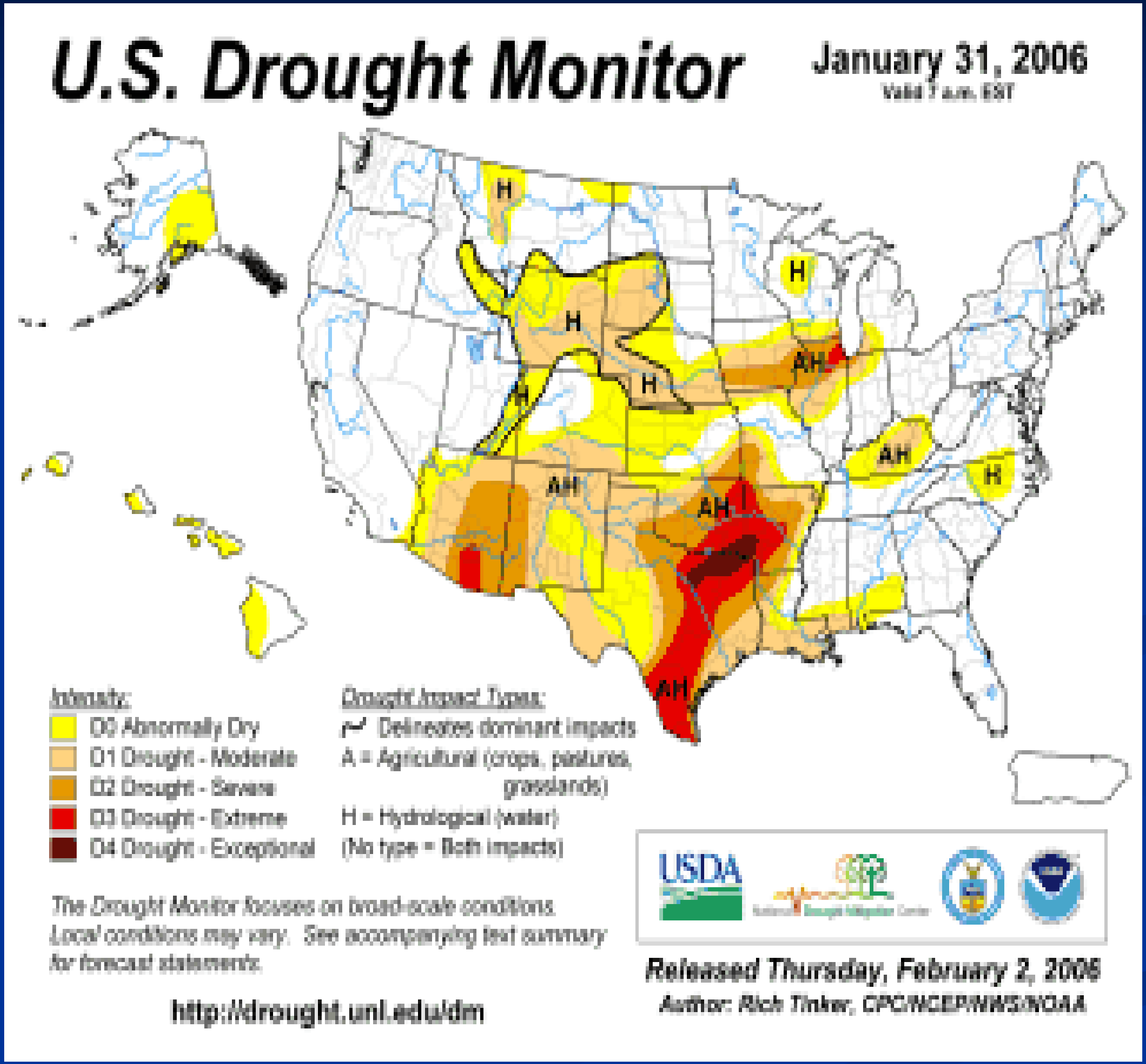

2005 Percent of Normal Inflow for Allatoona
400%
350%
300%
250%
200%
150%
100%
50%
0%
63%
109%
99%
109%
79%
141%
343%
167%
78%
62%
60%
87%
109%
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
YTD

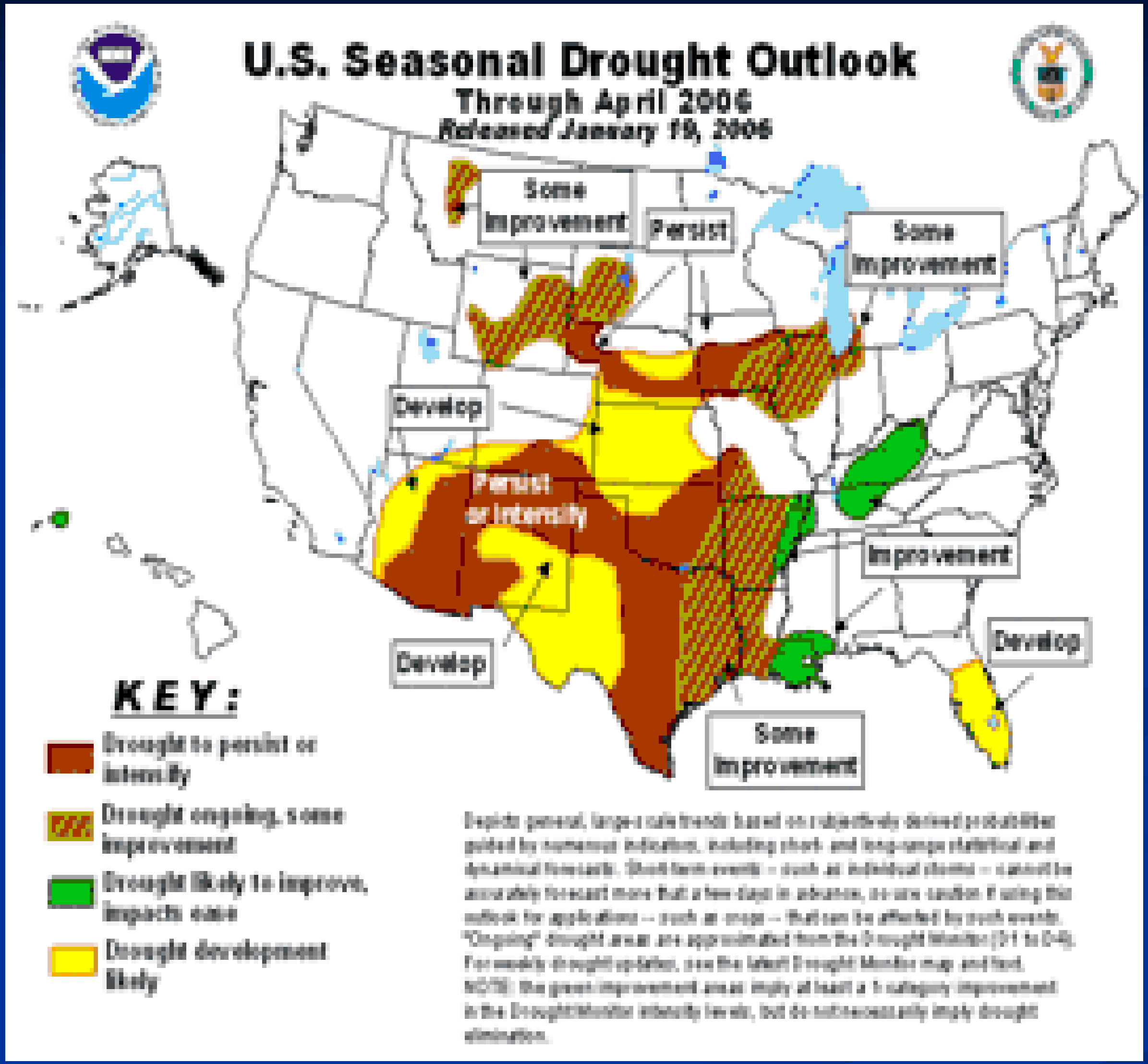
2006 Basin Inflows

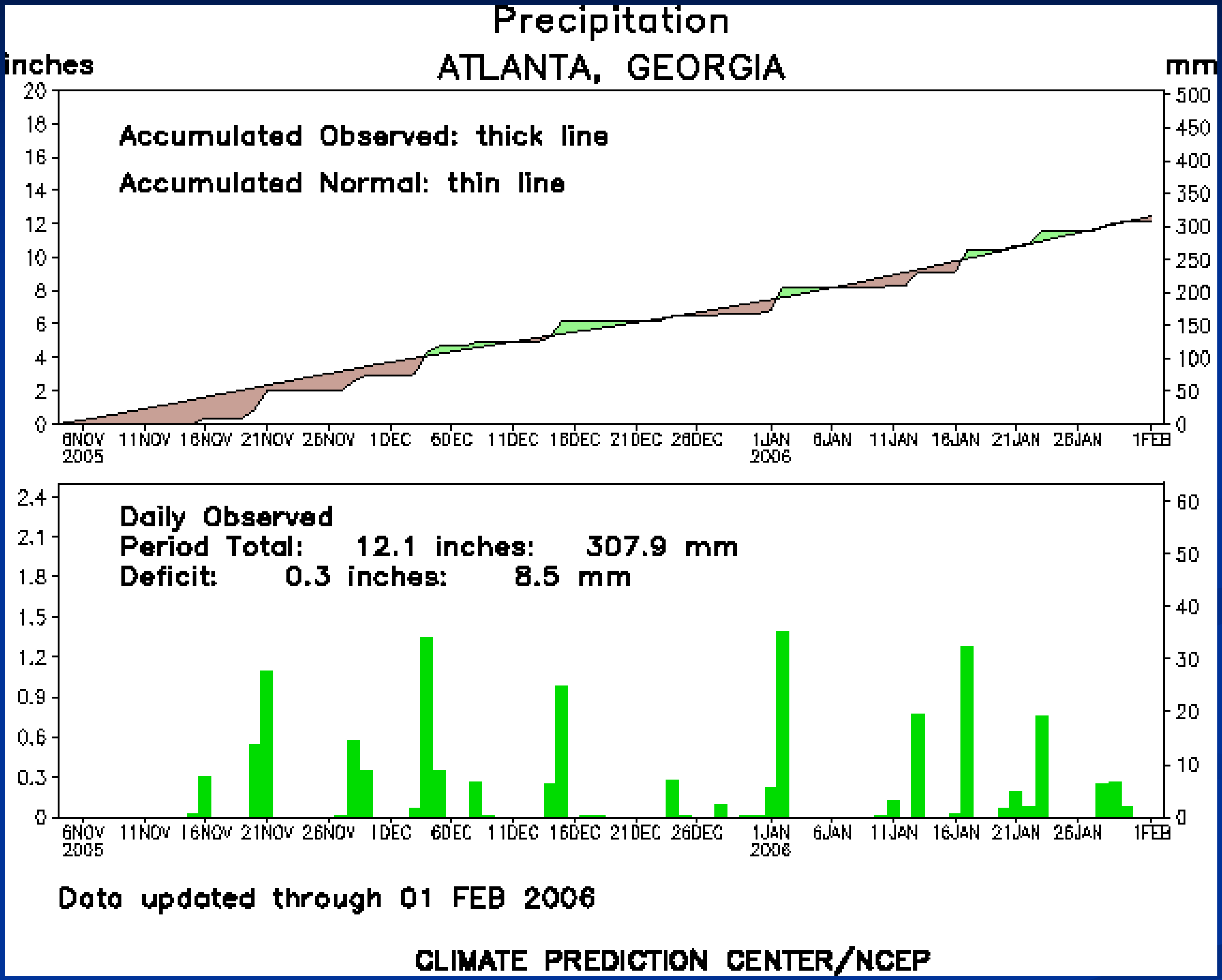
ACF = 98% for January

Allatoona = 89% for January

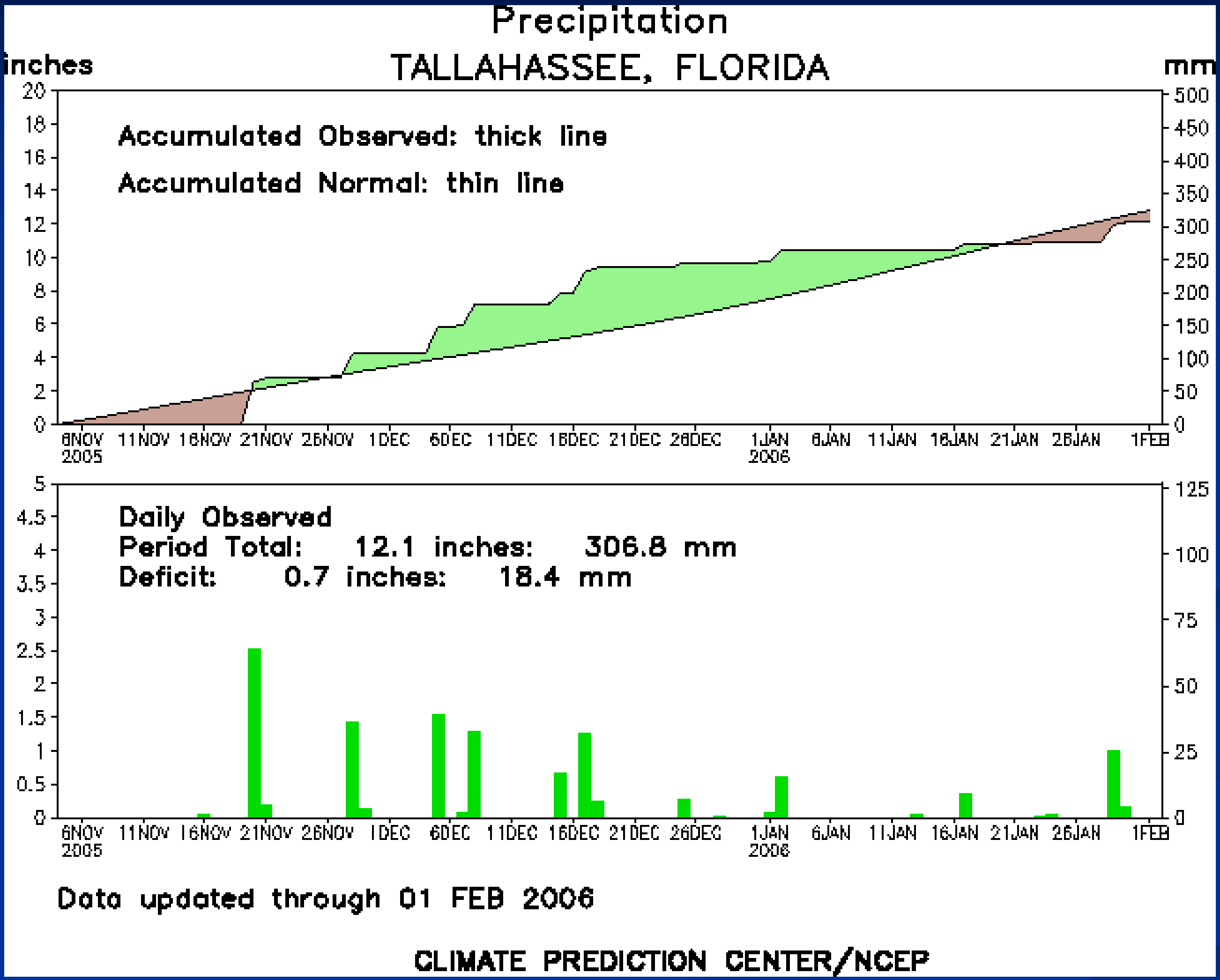
Southeast U.S. Climate Outlook


U.S. Drought Monitor
January 31, 2006
Valid 7 a.m. EST
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
Released Thursday, February 2, 2006
Author: Rich Tinker, CPC/NCEP/NWS/NOAA


U.S. Seasonal Drought Outlook
Through April 2006
Released January 19, 2006
Some Improvement
Persist
Some Improvement
Develop
Persist or Intensify
Improvement
Develop
Develop
Some Improvement
KEY:
Drought to persist or intensify
Drought ongoing, some improvement
Drought likely to improve, impacts ease
Drought development likely



Precipitation
ATLANTA, GEORGIA
inches
mm
Accumulated Observed: thick line
Accumulated Normal: thin line
6NOV 2005
11NOV
16NOV
21NOV
26NOV
1DEC
6DEC
11DEC
16DEC
21DEC
26DEC
1JAN 2006
6JAN
11JAN
16JAN
21JAN
26JAN
1FEB
Daily Observed
Period Total: 12.1 inches: 307.9 mm
Deficit: 0.3 inches: 8.5 mm
Data updated through 01 FEB 2006
CLIMATE PREDICTION CENTER/NCEP


Precipitation
TALLAHASSEE, FLORIDA
inches
mm
Accumulated Observed: thick line
Accumulated Normal: thin line
Daily Observed
Period Total: 12.1 inches: 306.8 mm
Deficit: 0.7 inches: 18.4 mm
6NOV 2005
11NOV
16NOV
21NOV
26NOV
1DEC
6DEC
11DEC
16DEC
21DEC
26DEC
1JAN 2006
6JAN
11JAN
16JAN
21JAN
26JAN
1FEB
Data updated through 01 FEB 2006
CLIMATE PREDICTION CENTER/NCEP

Dr. William Gray's Hurricane Forecast

Named storms = forecast 17 (avg = 9.6)

Hurricanes = forecast 9, (avg = 5.9)

Intense Hurricanes

(Cat 3-5) = forecast 5, (avg = 2.3)

www.water.sam.usace.army.mil

CESAM-OP-TR

SAM SOP 1130-2-9
XX Month Year

DEPARTMENT OF THE ARMY
Mobile District, Corps of Engineers
P.O. Box 2288
Mobile, Alabama, 36628-0001

Project Operations
RESERVOIR REGULATION AND COORDINATION
FOR FISH MANAGEMENT PURPOSES

1. Purpose. To provide a standing operating procedure (SOP) to be followed by Mobile District staff and selected Operations Division field offices to implement South Atlantic Division Regulation DR 1130-2-16, Project Operations, Lake Regulation and Coordination for Fish Management Purposes. This SOP (1) identifies designated periods of time within which fish spawn operations will be conducted at specific projects, (2) establishes protocols for coordination between the U.S. Fish and Wildlife Service (FWS), State fisheries personnel, and the Corps, and (3) provides for development of an annual plan for special water management operations by the Corps, in coordination with the FWS and the State fisheries agencies, that would balance impacts and benefits to both reservoir and riverine fisheries during the spring fish spawning period. This SOP is intended to benefit multiple sport fish and forage fish species having similar spawning habits.

2. Applicability. This SOP applies to the operation of Allatoona Lake, Okatibbee Lake, Lake Sidney Lanier, West Point Lake, Walter F. George Lake, Lake Seminole, and the Apalachicola River. In addition to project office staffs, technical and support staffs in the Mobile District Office have significant roles in the successful implementation of this SOP. Key offices are listed below.

Operations Division	OP-TR
Planning and Environmental Division	PD-EI
Engineering Division	EN-HW
Public Affairs Office	PA

3. References.

a. ER 1130-2-540, Environmental Stewardship Operation and Maintenance Polices, Chapter 2, Natural Resources Stewardship.

b. EP 1130-2-540, Environmental Stewardship Operation and Maintenance Guidance and Procedures, Chapter 2, Natural Resources Stewardship

This standing operating procedure supercedes District SOP 1130-2-9 dated 23 Feb 1995

c. ER 1130-2-550, Recreation Operation and Maintenance Polices, Chapter 3, Project Master Plans and Operational Management Plans.

d. EP 1130-2-550, Recreation Operation and Maintenance Guidance and Procedures, Chapter 3, Project Master Plans and Operational Management Plans.

e. DR 1130-2-16, Lake Regulation and Coordination for Fish Management Purposes.

f. DR 1130-2-18, Preparation of Operational Management Plan at Civil Works Water Resources Projects.

g. Executive Order 12962, Recreational Fisheries, 7 June 1995.

4. Procedures.

In most water years it will not be possible to hold both reservoir levels and river stages at a steady or rising level for the entire spawning period, especially when upstream reservoirs and/or the Apalachicola River spawning periods overlap. Droughts and floods within the basin also present specific water management challenges. During the spawning period applicable to each water body (paragraph 4(b)), the Corps shall operate for generally stable or rising reservoir levels , in accordance with the guidance of DR 1130-2-16, 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. When these management goals are not possible, impose an unreasonable compromise to other project purposes, or would conflict with other fish management concerns within the basin, the Corps shall consult with the State fishery agencies and the FWS on balancing needs within the system and minimizing the impacts of fluctuating reservoir or river levels. Modifications to fish spawn operations could include readjusting the base elevation for fish spawn operation purposes at a particular project, allowing a rapid lowering in elevation back to the base elevation or a readjusted elevation following a flood event, or other operational adjustments recommended by the interagency team to minimize impacts and/or enhance system-wide benefits. The Corps shall also consult with the State fishery agencies and the FWS on water management operations that would minimize fishery impacts and balance needs throughout the system for the remaining portions of the fish spawn periods. The Corps shall schedule management responsibilities that conflict with operating for stable or rising reservoir levels or relatively stable river stages outside the fish spawning period to the extent practicable, consistent with other applicable laws and regulations.

a. In February of each year Mobile District staff representatives will meet with the fisheries biologists from Alabama, Florida, Georgia, Mississippi and the FWS to discuss projected spring and summer trends, anticipated hydrological conditions within the basin, success of the past year's fish spawn, and ways to balance fisheries priorities between reservoir and river systems during the upcoming spawning season. An imbalance of prey and forage fish could occur following the second or third year of poor or unsuccessful spawning and recruitment, leading to poor sport fishing. Areas where the spawns were recently unsuccessful should be given higher priority for fish management operations under low water conditions.

b. The periods during which the Corps shall operate to achieve the purposes of this SOP are as follows:

Administrative Office	Project/Water Body	Principal Fish Spawning Period for Operational Consideration
ACF PROJ MGMT OFFICE	Walter F. George Lake	15 March – 15 May
	Lake Seminole	01 March – 01 May
	Apalachicola River	01 April – 01 June
ALLATOONA PROJ MGMT OFFICE	Allatoona Lake	15 March – 15 May
LANIER PROJ MGMT OFFICE	Lake Sidney Lanier	01 April – 01 June
OKATIBBEE PROJ MGMT OFFICE	Okatibbee Lake	01 April – 01 June
WEST POINT PROJ MGMT OFFICE	West Point Lake	01 April – 01 June

c. Project personnel shall contact local State fisheries management personnel responsible for their project areas prior to the initiation of the identified spawning period and keep in close contact with them throughout the spawning period. PD-EI shall contact and maintain coordination with the State of Florida fisheries management personnel regarding initiation and status of fish spawning on the Apalachicola River. Information regarding the actual progress of fish spawn (i.e., has started, is in progress, is in peak, or has ended) should be relayed by project personnel to the Mobile District Office through OP-TR, and reported to EN-HW and PD–EI during the weekly water management meetings.

d. EN-HW will consider hydrologic conditions within the basin, recommendations from the State fisheries management agencies and FWS, and status of fish spawn at other locations within the basin to schedule fish spawn operations for each project area (reservoir or river system) within the basin. The goal will be to provide generally stable or rising levels on the reservoirs and/or generally stable or gradually declining river stages on the Apalachicola River for approximately 4 to 6 weeks during the spawning period identified for each water body. Efforts to minimize fishery impacts and balance fishery resource and other project needs within the basin during the remaining portions of the spawning periods will also consider recommendations from the State fishery management agencies and FWS. A summary of the status of fish spawn operations at each project (including date and elevation at initiation and completion of fish spawn operations) will be posted on the Mobile District Water Management website.

e. EN-HW will notify the PA office when fish spawning season begins and will invite PA to specific weekly water management meetings when important decisions having public impact are likely to be made. PA will advise the news media within 24 hours of notification of any specific water management actions that are potentially detrimental to the fish spawn, including an explanation of the reasons for the water management actions.

f. OP-TR will maintain an updated list of State and FWS fisheries biologists for the lake and river projects. OP-TR personnel will attend weekly water management meetings during the spawning period, relay pertinent information relating to the status of fish spawn or other fish management concerns to EN-HW, PD-EI and PA, and send weekly, either by e-mail or telephone, water conditions data to appropriate State and FWS fisheries personnel. OP-TR and PD-EI will consult telephonically with State and FWS fisheries personnel as necessary, and include project personnel in the consultation as appropriate. Any significant decisions based on the weekly water management meetings will also be relayed telephonically or by email to State fisheries personnel, FWS, project personnel, and South Atlantic Division personnel by OP-TR. PD-EI will advise any environmental groups or other interested stakeholder groups of the proposed action. At the conclusion of the spawning period, OP-TR will forward a summary report of the annual fish spawn operations to State fisheries management agencies, FWS, and South Atlantic Division, with a copy to PD-EI.

g. OP-TR, EN-HW, PD-EI and PA will coordinate directly with each other or call additional meetings as the need arises.

Date _______________

PETER F. TAYLOR, JR.
Colonel, Corps of Engineers
Commanding

DISTRIBUTION: B

Enclosure 16

Memorandum for Record
Informal Consultation Telecon
12 March 2004

CESAM-PD-EI 12 March 2004

MEMORANDUM FOR RECORD

SUBJECT: Coordination of Fish Spawn Operations on the Apalachicola-Chattahoochee-Flint Rivers (ACF)system, and Measures Necessary for Protection of Gulf Sturgeon Critical Spawning Habitat on the Apalachicola River

1. On Tuesday, 9 March 2004, the US Army Corps of Engineers, Mobile District, Water Management Section cautioned that conditions within the ACF basin were becoming extremely dry and there were concerns about whether we would be able to river levels above 14,000 cfs, as requested by US Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWCC) during our 12 February Annual Coordination Meeting, without impacting reservoir levels upstream. (The maintenance of a minimum 14,000 cfs flow was requested because this is the threshold flow to provide for inundation of floodplain areas adjacent to the Apalachicola River; at flows below 14,000 cfs fish spawn habitat is restricted to the river channel alone.) We had initiated fish spawn operations at Lake Seminole and were attempting to maintain reservoir levels above the critical elevation of 76.7 feet. We were also scheduled to begin fish spawn operation at Walter F. George (WFG) lake on 15 Mar, and there was concern that sustaining flows on the Apalachicola River above 14,000 cfs would require us to lower lake levels at WFG during fish spawn operations, which would also jeopardize the ability to refill the lake if dry conditions continued. No significant rainfall was projected for at least the 10-day outlook.

2. On Wednesday, 10 March, we (Joanne Brandt and Matt Lang (CESAM-PD-EI), Memphis Vaughan, Cheryl Hrabovsky and Rob Erhardt (CESAM-EN-H) conducted a telephone conference with Jerry Ziewitz (USFWS) and Ted Hoehn of (FWCC) to inform them of the pending conflict between maintaining lake levels during reservoir spawning and our ability to maintain river flows above 14,000 cfs. We were also concerned that if we were to reduce releases to the river in order to maintain steady lake levels during reservoir fish spawn, there could be impact to downstream Gulf sturgeon spawning habitat on the Apalachicola River below Jim Woodruff Dam (JWD). The Apalachicola River is also designated as critical habitat for the Gulf sturgeon, and suitable spawning habitat and suitable flow regime are primary constituents necessary to support critical habitat for the sturgeon. We are currently mapping areas of suitable spawning habitat on the river but this effort is not yet complete. Therefore, at this time we will have to assume that the rock outcrop area located immediately below JWD is what is minimally necessary to provide suitable spawning habitat for the sturgeon. We currently estimate that approximately 11,000 cfs is required to minimally inundate the rock outcrop spawning areas immediately below the dam and 14,000 cfs would provide minimal sufficient inundation to allow for spawning over the entire rock outcrop. As a result of this discussion, it was agreed to gather information on riverine temperature and the relative status of fish spawning on the river; and information on timing of migration of sturgeon up the river to spawning habitat in the upper river. We would have to make a decision on whether we would reduce flows on the river and to what river stage not later than Friday, 12 March. We agreed to schedule a follow-on telephone

conference on Friday morning to determine the best course of action to conserve water within the basin and minimize impacts to both reservoir and river spawning activities.

3. On Friday, 12 March we (Joanne Brandt, Matt Lang, Memphis Vaughan, Rob Erhardt) re-convened the teleconference with Jerry Ziewitz and Ted Hoehn, and Russ Ober and David Partridge of Georgia Department of Natural Resources (GDNR). Rob gave a prospective forecast of continued dry conditions, and that no significant rainfall was predicted to occur in the basin through the end of March. Above normal warm temperatures are also forecast to begin next week. Memphis gave a status of our current water management actions and noted it would be necessary to reduce flows immediately if we are to maintain the critical flow at Lake Seminole and allow WFG to maintain steady or rising conditions. Spawning operations on WFG are scheduled to begin on Monday, 15 March and there is also a bass tournament scheduled for that week.

Ted noted that Crappie had already started to spawn on the river, and other species (e.g. large-mouth bass) were ready but had not yet begun.

Jerry reported that the sturgeon were staging near the mouth of the river, but few had yet migrated upriver to the spawning grounds. It was assumed that the warmer temperatures would initiate migration of the sturgeon upstream and that spawning would also likely begin “en masse” in the Apalachicola River. An minimum elevation of 11,200 cfs is required to just cover the rock outcrop below JWD. Higher flows are necessary to make the majority of the outcrop area suitable for spawning Jerry advised that we should not draw down upstream reservoir to maintain flows on the river, unless it is to avoid a short-term dip in river stages. It was recommended that we maintain a minimum flow at or above 11,200 cfs as long as system inflows allow. He noted that if inflow into JWD falls to less than 11,200 cfs during peak sturgeon spawning periods (i.e., when water temperatures are in the 64 to 71 degree Fahrenheit range), that we operate the ACF system in a daily “run-of-river” mode in order to avoid causing the take of eggs and larvae spawned on the river at stages less than 11,200 cfs.

GDNR reported that crappie had begun to spawn last week and that bass had started and stopped spawning several times over the last few weeks due to fluctuating temperatures. GDNR noted that there was a lot of vegetation throughout Lake Seminole, so letting it drop to the lower elevations near the critical elevation would still allow fry to find protection from predators, etc. However, there is only a narrow band of vegetation in shallow areas at WFG. It would be preferable to be near elevation 189.0 feet at WFG during spawning operations in order to provide for inundation of the vegetated areas. We were currently at 187.8 feet at WFG. GDNR noted that if levels could not be maintained at near 189.0 feet during the entire spawning period, it would be preferable to be higher for at least a portion of the period and then gradually fall to an elevation below the critical elevation (greater than ½ foot fall over spawning period), if water continues to be scarce.

Ted noted that there had been several precipitous drops in river stage over the last couple of weeks, and it would be preferable to draw down river stages gradually now prior to the onset of the warmer temperatures. We could then re-evaluate operations near 1 April when fish spawn operations are scheduled to begin on the Apalachicola River.

Jerry and Ted agreed to collect additional temperature data so we can determine the initiation of peak spawning activities to assist in our water management decisions. The Corps may want to assist in collecting water temperatures immediately below JWD near the sturgeon spawning habitat.

4. Based on the above discussions, it was agreed to immediately begin gradually reducing releases from JWD to the Apalachicola River from 14,000 cfs to 11,200 cfs over the next few days. Flows will be reduced at approximately 1000 cfs per day (approximately ½ foot per day), and should be in the approximate 11,200 cfs range early next week (around 15 March). We will maintain levels at Lake Seminole at or above the critical elevation of 76.7 feet. We will allow WFG to maintain steady elevation and increase slightly (currently at 187.8 feet and expected to be aqt 188.2 feet by end of next week). We will schedule a follow-on telephone call on Wednesday, 17 March, to report the current meteorological projections, status of sturgeon migration and fish spawn activities, and to discuss any additional modifications to our water management operations.

5. The above discussion also represents documentation of informal consultation under Section 7 of the Endangered Species Act of 1973, to provide for water management actions that will minimize adverse effects to the Gulf sturgeon during dry weather and resultant low flow conditions in the ACF basin.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

CF:

Jerry Ziewitz/USFWS
Ted Hoehn/Charlie Mesing/FWCC
Russ Ober/David Partridge/GDNR
Memphis Vaughan/Cheryl Hrabovsky/Rob Erhardt/CESAM-EN-HW
Ken Day/CESAM-OP-TR
Paul Bradley/CESAM-OP-TN
Les Brusse/Don Morgan/CESAM-OP-AC-LS
Ron Puhr/CESAM-OP-AC-WG

Eddie Sosebee/CESAM-OP-AC
Mike Treherne/CESAM-OP-WP
Erwin Topper/CESAM-OP-SL
John Anderson/CESAM-OP-T
Jan Shelby/CESAM-PA
Brian Peck/CESAM-PD-EC
Matt Lang/Brian Zettle/CESAM-PD-EI
Diane Findley/CESAM-PD-E
Curtis Flakes/CESAM-PD

Enclosure 17

Memorandum for Record
Informal Consultation Telecon
1 April 2004

CESAM-PD-EI 1 April 2004

MEMORANDUM FOR RECORD

SUBJECT: Coordination of Fish Spawn Operations on the Apalachicola-Chattahoochee-Flint Rivers (ACF) system, and Measures Necessary for Protection of Gulf Sturgeon and Critical Spawning Habitat on the Apalachicola River

1. On Thursday, 1 April 2004, the U.S. Army Corps of Engineers, Mobile District, conducted our weekly teleconference call with the Federal and State fish management agencies to coordinate our water management operations in support of fish spawning activities during the extended dry conditions being experienced this spring. We are currently experiencing one of the driest months for March on record, with average inflows for the ACF basin in March estimated at 37 percent of historical levels. Those in attendance from Mobile District included Memphis Vaughan, Cheryl Hrabovsky and Rob Erhardt (CESAM-EN-HW), Joanne Brandt (CESAM-PD-EI), and Ken Day (CESAM-OP-TR). Fish management agency representatives included Jerry Ziewitz of U.S. Fish and Wildlife Service, and Ted Hoehn and Charlie Mesing of Florida Fish and Wildlife Conservation Commission. Russ Ober of Georgia Department of Natural Resources was unable to join the initial teleconference call, but was contacted following the call to discuss actions that might affect Lake Seminole, Walter F. George Lake and West Point Lake.

2. Rob indicated that rainfall was received in northeast Alabama and north Georgia earlier this week, ranging between 0.4 – 1.3 inches; however no rainfall was received in the central to southern parts of the basin. It is expected to continue with dry conditions over the next 5-6 days, and cooler than normal over the next couple of days and then returning to normal temperatures for this time of year. There is a possible rain system forecast for the basin in 7-8 days.

3. Memphis and Cheryl indicated that the inflows into the basin had fallen below 10,000 cfs last week, have peaked to about 14,000 cfs after the recent rainfall, but are expected to fall back to lower inflows over the next few days. We expect that we can continue to release the 11,500 cfs over the next week and possibly up to 2 weeks, but would then have to begin gradually reducing releases to equal inflows to the system if we do not receive additional rainfall in the basin. Jerry confirmed that would be consistent with his earlier recommendations on water management actions to minimize impacts to Gulf sturgeon spawning activities on the Apalachicola River (i.e., hold at 11,500 cfs release unless inflows drop to below 11,500 cfs, and then manage releases to equal inflows to the basin). FWCC concerns were that when river stages are reduced that it be gradual. Memphis confirmed that any planned reductions in releases would be very gradual, probably in range of 500 cfs increments over several days, while monitoring inflows into the system.

4. Charlie noted that the temperatures below the dam measured earlier this week were 68^{o} F. Optimal temperatures for Gulf sturgeon are in the range of 65^{o} to 75^{o} F. However, it was noted that the cooler temperatures and cooler nights have probably delayed and drawn out fish spawning this year. FWCC have been monitoring striped bass spawning and have collected few

fish and the bass spawn has been delayed. Jerry expected the sturgeon spawning has been similarly slowed up this year due to the fluctuating temperatures. They have not been able to locate sturgeon in the coastal areas and assume that they have begun moving up river. Charlie noted that FWCC will be collecting temperatures below Jim Woodruff early next week, and will relay that information to confirm whether the temperatures are still in the range conducive to sturgeon spawning.

5. Memphis suggested that we consider a press release or other means of getting the word out about our weekly coordination meetings, efforts to conduct our water management operations in support of fish spawning, and how we have tried to minimize impacts during the extremely dry spring months. Mobile District may initiate a press release, and may have our public affairs person (Marilyn Phipps) call the agencies for interview statements for inclusion in the release. USFWS and FWCC were willing to provide statements for the release.

6. In a separate follow-on teleconference, Joanne and Cheryl contacted Russ to discuss anticipated conditions at Walter F. George Lake and Lake Seminole over the next week or so. Fish Spawn operations began at Lake Seminole on 4 March. We are just completing 4 weeks of operations and have been able to hold the lake at or above the critical elevation of 76.67 feet. Cheryl advised that in order to continue to provide the 11,500 cfs release from Jim Woodruff, Lake Seminole elevations were anticipated to fall to approximately 76.5 feet, and should be able to hold at that elevation for a while. Walter F. George is currently at 188.5 feet and is expected to be at 188.3 feet by next weekend, which is still above the critical elevation for WFG. It is understood that this is still below the 189-foot optimal elevation preferred for WFG fish spawning, but also that this is above the 188-foot rule curve for WFG for this time of year (winter pool is 188.0, and refilling occurs between 1 May and 1 June, with elevation 189 achieved around 15 May). Russ noted that the bass in Seminole were in nursery stage, but should not be affected by the proposed drawdown of Lake Seminole since there is abundant vegetation in the lake at various depths. Russ would like to consider possible holding of WFG to higher elevations in future years during the month of April to enhance fish spawning – with elevation 189 the optimal level to assure inundation of vegetation rimming the lake. We agreed to consider possible temporary actions in future years, if water conditions and forecast weather condition allow, but advised that we have serious concerns about the risks of holding the lake above the "flood control" winter pool. This is something that can be discussed during our February 2005 annual coordination meeting. Cheryl also asked whether there was any reason to delay fish spawn operations, which are scheduled to begin at West Point Lake and Lake Lanier on 1 April. Russ thought that is was still appropriate to begin but will contact Brent Hess, the POC for West Point Lake, to confirm.

7. We agreed to continue these teleconferences into next week. Our next scheduled teleconference is Thursday, 8 April, 9:00 a.m. Ted will be unavailable next week, however, Charlie or Rick Long will try to be available. Charlie agreed to provide comments by email with relevant information on temperatures, spawning progress, prior to the teleconference in case he is unavailable for the call.

8. This memorandum provides documentation of informal consultation pursuant to Section 7 of the Endangered Species Act of 1973, regarding our attempts to provide for water management actions that will minimize adverse effects to the threatened Gulf sturgeon during the extended dry weather and resultant low flow conditions in the ACF basin.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

CF:

Jerry Ziewitz/Gail Carmody/USFWS
Ted Hoehn/Charlie Mesing/Rick Long/FWCC
Russ Ober/David Partridge/Brent Hess/Les Ager/Reggie Weaver/Jeff Durniak/GDNR
Chris Greene/Damon Abernethy/Jon Hornsby/Nick Nichols/Mike Newman/ADCNR
Memphis Vaughan/Cheryl Hrabovsky/Rob Erhardt/CESAM-EN-HW
John Anderson/CESAM-OP-T
Ken Day/CESAM-OP-TR
Paul Bradley/CESAM-OP-TN
Bill Smallwood/CESAM-OP-M
Carl Dyess/CESAM-OP-D
Terry Jangula/CESAM-OP-GE
Les Brusse/Don Morgan/CESAM-OP-AC-LS
Eddie Sosebee/CESAM-OP-AC
Ron Puhr/CESAM-OP-AC-WG
Mike Treherne/Bob Chitwood/CESAM-OP-WP
Erwin Topper/Pat Taylor/CESAM-OP-SL
Janet Shelby/Marilyn Phipps/CESAM-PA
Pat Robbins/ CESAM-DX
Matt Lang/CESAM-PD-EI
Brian Peck/CESAM-PD-EC
Diane Findley/CESAM-PD-E
Curtis Flakes/CESAM-PD
Gary Mauldin/Jonathan Davis/CESAD

Enclosure 18

Memorandum for Record
Informal Consultation Telecon
20 April 2004

CESAM-PD-EI 20 April 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 20 April 2004

1. The following agency representatives participated in today's teleconference call:

Jerry Ziewitz, US Fish and Wildlife Service, Panama City, FL
Ted Hoehn, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL
Rick Long, Florida Fish and Wildlife Conservation Commission, Midway, FL
Russ Ober, Georgia Department of Natural Resources, Albany, GA
Memphis Vaughan, US Army Corps of Engineers, Mobile District, Water Management
Rob Erhardt, US Army Corps of Engineers, Mobile District, Meteorologist
Joanne Brandt, US Army Corp of Engineers, Mobile District, Planning and Environmental

2. Dry conditions continue, especially throughout the Southeast and the ACF basin. Rob Erhardt noted that there would be a D-1 (Moderate Drought) condition declared by the National Weather Service for the southeast, beginning Thursday, 22 April. There is no rainfall forecast for the ACF basin until next Monday, 26 April. That rainfall is likely to be spotty to light, less than ½ inch. Weather conditions will then turn cooler and dry for the following week. Dry conditions are expected to worsen over the next few weeks. Month of April is approximately 10 percent of normal to date.

3. Memphis noted that current inflows into the ACF basin are approximately 9300 cfs (See attached chart showing 3-day average inflows through months of March and April). We have been holding outflow from Jim Woodruff Dam (JWD) at 11,500 cfs since 15 March. Based on the current inflows and the projected dry conditions over the next couple of weeks, and possibly longer, we cannot continue to release 11,500 from JWD without substantially drawing down the upstream reservoirs. The Mobile District proposes to begin cutting back releases from JWD, beginning tomorrow (Wednesday, 21 April), by approximately 500 cfs per day (approx. ¼ foot per day drawdown on river) to a level of 9000 cfs. This would result in a drop in river stages of approximately 1-1/2 feet (from current stage of 5.0 ft to approx. 3.5 ft at Blountstown gage). This release could likely be held for approximately 2 weeks. We would continue to monitor climatic conditions and inflows into the system. In the event of no rainfall, we would likely then propose to cut back flows again to approximately 8000 cfs from JWD. Projected impacts to lake conditions due to the proposed cut-back in flows to 9000 cfs have been posted on the Mobile District Water Management website. Lake Lanier should hold steady at approximate elevation 1070 ft.; West Point Lake would be steady and slightly rising from elevation 632 ft.; Walter F. George would fall to an elevation between current elevation of 188 and elevation 187.5 ft.; and Lake Seminole would hold steady at approx. 76.5 ft. Lake Lanier would be within Zone 1; West Point Lake and Walter F. George would be in Zone 2 and close to boundary of Zone 3. The above plan is consistent with previous guidance from US Fish and Wildlife Service and our

operations over the past few weeks to match outflows from JWD to the system-wide inflows, in order to minimize impacts on the threatened Gulf sturgeon spawning activities.

4. Jerry and Rick had been on the Apalachicola River below JWD last week. Approximately ¼ of the rock ledge Gulf sturgeon spawning habitat immediately below the dam was exposed, but the remainder was still submerged and would be available for spawning at 11,500 cfs flow. Some portion may still be submerged at the lower releases of 9000 cfs. Water temperatures last week were measured at 17 to 18 degrees Centigrade, which is within the optimal range for sturgeon spawning. No tagged sturgeon were detected in the upper 20 miles of the river. Also, there has been little if any sign of striped bass spawning in the upper Apalachicola River. This is consistent with observations on the upper Yellow River as well. It is suspected that the Gulf sturgeon are still congregated in staging areas downstream and have not completed their migration upstream to the spawning areas. Temperatures are suspected to be in the upper range of optimal conditions for spawning, but could fall again next week due to projected cooler weather conditions. Fluctuating temperatures and low flow conditions are apparently delaying and sustaining spawning conditions for this spring.

5. US Fish and Wildlife concurred with the above proposed water management strategy, which matches outflow to system-wide inflow and maintains stable conditions on the lakes. At this time it is understood that we are responding to climatic/hydrological conditions and the proposed reduction in releases therefore does not constitute an action triggering formal Section 7 consultation under the Endangered Species Act. We will continue to document agency discussions and proposed water management operations in response to developing drought conditions to document informal Section 7 coordination. Jerry will get back to us if any additional documentation or formal coordination of the proposed actions and agency agreement would be required.

6. Attached chart shows status of fish spawn operations within Mobile District for this spring. Our next teleconference is scheduled for late next week, Thursday, 29 April, 9:00 a.m. CDT/10:00 a.m. EDT.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Enclosure 19

Memorandum for Record
Informal Consultation Telecon
29 April 2004

CESAM-PD-EI 29 April 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 29 April 2004

1. The following agency representatives participated in today's teleconference:

Jerry Ziewitz, US Fish and Wildlife Service, Panama City, FL
Ted Hoehn, Florida Fish and Wildlife Service, Tallahassee, FL
Memphis Vaughan, US Army Corps of Engineers, Mobile District Water Management
Rob Erhardt, US Army Corps of Engineers, Mobile District Meteorologist
Joanne Brandt, US Army Corps of Engineers, Mobile District, Planning & Environmental
Matt Lang, US Army Corps of Engineers, Mobile District, Planning & Environmental

2. Based on last week's teleconference discussions, we began on Wednesday, 21 April, to cut releases from Jim Woodruff Dam (JWD) to the Apalachicola River by approximately 500 cfs per day, to reduce releases from 11,500 cfs to approximately 9000 cfs. Current ACF basin inflows at that time were approximately 9300 cfs, with no significant rainfall projected in the basin. We have been holding releases from at approximately 9100 cfs since Tuesday, 27 April. ACF basin inflows were as low as 8000 cfs on 25 April, but have recovered to approximately 9400 cfs due to limited rainfall over the weekend.

3. Rob noted that there was a chance of scattered rainfall to occur over the ACF basin late this week and possible heavy thunderstorms over the weekend (Sunday). However, there is not a high confidence in where the rainfall will occur or how much. It is then projected to turn cooler and drier, with no sing of additional rainfall thereafter.

4. Memphis indicated that we could hold releases from JWD at approximately 9100 cfs until early next week, in order to determine how much rainfall may occur in the basin. If we do not receive significant rainfall, then we will plan to reduce releases from JWD by another increment to approximately 8000 cfs, with releases ramped down by approximately 500 cfs per day, beginning on Monday, 3 May. That release would probably be maintained for approximately 1 week. If dry conditions continue, we would then propose to ramp down to approximately 6000 cfs release by mid-May. If we do receive rainfall in the basin, we will evaluate how much and probably be able to sustain releases of 9000 cfs for another week and would continue to monitor reservoir levels and climatic conditions to determine the next action. Our primary goal will be to maintain releases to match inflows into the basin as much as possible, but to also be able to refill the lakes as much as possible to provide storage for future releases if dry conditions continue into the summer. The lake level and Blountstown stage graphs shown on the water management website for this week are based on no rainfall occurring in the basin and on cutting releases to 8000 cfs early next week. These graphs will be updated in the event we do receive rainfall in the basin over the weekend.

5. Jerry indicated they had returned to the river on Tuesday, 27 April, to attempt to track tagged Gulf sturgeon by sonar. They located one tagged sturgeon in the Alum Bluff area (approx. NM) and one on the lower river, but none immediately below JWD. They have not found Gulf sturgeon in the upper Yellow River either. This may just be a poor year for Gulf sturgeon spawning, due to climatic and low flow conditions or other possible factors. Jerry noted that the proposed management plan to continue to match releases from JWD to basin inflows is the best recourse to avoid impact to Gulf sturgeon spawning. This MFR documents informal consultation with USFWS regarding actions taken to minimize impacts to Gulf sturgeon and satisfies Section 7 consultation requirements.

6. The next teleconference is schedule for Tuesday, 4 May, 10:30 a.m CDT/11:30 a.m. EDT.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Enclosure 20

Memorandum for Record
Informal Consultation Telecon
4 May 2004

CESAM-PD-EI

5 May 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 4 May 2004

1. The following agency representatives participated in this week's teleconference:

Jerry Ziewitz, US Fish and Wildlife Service, Panama City, FL
Ted Hoehn,, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL
Charlie Mesing, Florida fish and Wildlife Conservation Commission, Midway, FL
Cheryl Hrabovsky, US Army Corps of Engineers, Mobile District, Water Management
Rob Erhardt, US Army Corps of Engineers, Mobile District, Meteorologist
Joanne Brandt, US Army Corps of Engineers, Mobile District, Planning and Environmental

2. Rob gave an update on the amount of rainfall that was received due to the weather system that passed through the District over the weekend. Up to 3 inches was received in southeast Alabama and southwest Georgia and across the Florida Panhandle. However only between ½ inch to 1 inch was received in north Georgia and Alabama. In the ACF basin, most of the rainfall occurred over Lake Seminole and the Flint River basin, which does not provide for any significant storage. Some rainfall was captured in West Point Lake and Walter F. George Lake. No additional rainfall is predicted for the next 10 days to 2 weeks, and the 5-week forecast is for continued dry and warm conditions. Daytime temperatures by the end of the week will be in the upper 1980s.

3. Cheryl noted that due to the recent rainfall in the basin, we can sustain a minimum of 9100 cfs release from Jim Woodruff Dam through this week and into early next week. We are currently releasing 10,000 cfs due to inflows and head limits at Jim Woodruff Dam, which may increase somewhat depending upon additional inflows from the Flint River arm. However, we expect to gradually reduce releases over the next few days. By early next week we will have to evaluate the status of the upstream reservoirs and the inflows to the system to determine when and how much to reduce releases if we do not receive any additional rainfall in the basin.

4. Ted and Charlie were concerned that due to the water temperatures and full moon that peak spawning of the non-bass species was occurring in the floodplain areas. They requested that the 9100 cfs release from Jim Woodruff be sustained as long as possible and that any drawdowns on the river be as gradual as possible. Cheryl noted that we could not sustain the 10,000 cfs release and may not be able to sustain the 9100 cfs past early next week, but that any reduction in release would be very gradual. Jerry concurred with the recommendations that any drawdown on the river be as gradual as possible, but that any drawdowns on the reservoirs also be very gradual since shad species are likely spawning in the reservoirs and fry from recent spawn could also be affected by any dramatic changes in reservoir levels.

5. The reservoir level charts have been updated and posted on the Mobile District Water Management Website, and reflect the following assumptions: no additional rainfall in the basin;

holding a release from Jim Woodruff Dam of 9100 cfs through 11 May; gradual reduction to 8500 cfs for the remainder of the week of 11 May; gradual reduction to 7500 cfs for the week of 17 May; followed by an additional gradual reduction to 6500 cfs for the week of 24 May. We will continue to monitor basin conditions and any rainfall received in the basin over the next few weeks and make adjustments as necessary or in response to additional natural flows in the system.

6. Below is a summary of the status of fish spawn operations for this year.

a. Fish spawn operations at Allatoona Lake began 15 March and are still underway. Allatoona Lake levels have continued to closely follow the rule curve for the lake and is currently at elevation 840 ft, which is the top of the conservation pool.

b. Fish spawn operations at Okatibbee Lake began on 1 April and are still underway. Okatibbee Lake levels have been maintained relatively steady or rising and are currently near 342 ft (top of conservation pool is 344 ft.).

c. Fish spawn operations began at Lake Lanier on 1 April and are still underway. Lake Levels have been maintained steady at approximate 1070 ft. Top of conservation pool is 1071 ft.

d. Fish spawn operations began at West Point Lake on 1 April and are still underway. Lake elevations have been held steady or slightly rising as we attempt to follow the rule curve. Elevations are currently at approximate elevation 632 ft. and projected to remain between 632 and 633 over the next few weeks. The rule curve shows refilling of the lake by 1 June, with levels during the month of May between elevations 633 and 635. Lake levels are projected to remain below the rule curve over the next few weeks, with levels remaining between Zones 1 and 2.

e. Fish spawn operations began at Walter F. George on 15 March and are still underway. Lake levels have been at or above the rule curve of 188 ft for winter pool. The rule curve shows refilling of the lake during the month of May with full pool of 189 ft by 1 June. However, lake levels are projected to remain steady at approximately 188.5 ft over the next few weeks, remaining between Zones 1 and 2.

f. Fish spawn operations began at Lake Seminole on 4 March and the minimum 4-week operations period was completed on 8 April. Recent rainfall raised lake levels to between 77.0 and 77.5, with stages predicted to remain above 76.5 over the next few weeks.

g. Fish spawn operations began on the Apalachicola River on 15 March when we began to manage releases from Jim Woodruff to maintain a minimum flow of approximately 11,500 cfs to provide for minimum inundation of sturgeon fish spawning habitat located immediately below the dam, and matching releases from Jim Woodruff to match basin inflows into the system. Beginning 21 April, we have gradually reduced releases to match system inflows. Blountstown gage on the Apalachicola Rive is approximately 4.0 feet, and expected to be gradually lowered (less than ½ foot per day) over the next few weeks to approximately 2.0 feet if we do not receive additional rainfall in the basin. A reduction in releases of 1000 cfs equated to approximately ½ foot fall in stage at Blountstown gage.

7. The next Fish Spawn Coordination teleconference is scheduled for Tuesday, 11 May, 10:30 a.m. CDT/11:30 a.m. EDT. Please let me or Matt Lang know if you plan to participate in this conference call so we will be able to patch you in.

JOANNE BRANDT
Compliance Manageer
Inland Environment Team

Enclosure 21

Memorandum for Record
Informal Consultation Telecon
11 May 2004

CESAM-PD-EI

11 May 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 11 May 2004

1. The following agency representatives participated in this week's teleconference:

Ted Hoehn, Florida Fish and Wildlife Conservation Commission, Tallahassee, FL
Charlie Messing, Florida fish and Wildlife Conservation Commission, Midway, FL
Brent Hess, Georgia Department of Natural Resources, West Point lake Contact
Cheryl Hrabovsky, USACE, Mobile District, Water Management
Memphis Vaughan, USACE, Mobile District, Water Management
Rob Erhardt, USACE, Mobile District, Meteorologist
Joanne Brandt, USACE, Mobile District, Planning and Environmental
Matthew Lang, USACE, Mobile District, Planning and Environmental

2. Rob gave an update on the amount of rainfall projected due to the weather system that will hopefully pass through the District over the next couple of days and into the weekend. The majority of the rain over the next few days will be localized over the Alabama/Mississippi border (projected to receive 1 ½ to 2 inches). This rain event will not directly affect the lower portions of the ACF basin. Only scattered or spotty rainfall is projected in West Georgia. The greatest possibility for rains within the ACF basin look to be forecasted for the upper reaches of the Chattahoochee River and northern Georgia. Dry and continued warm conditions are forecast for next week.

3. Cheryl noted that we are currently releasing approximately 10,800 cfs due to inflows and head limits at Jim Woodruff Dam. Basin inflows are currently around 10,000 cfs and expected to decline gradually over the next few days. Therefore, we expect to gradually reduce releases over the next few days by approximately 500 cfs per day. Without any rainfall in the basin, this would bring us to approximately 8,100 cfs release from Jim Woodruff by this weekend. If there is no additional rainfall in the basin, this would result in West Point Lake levels remaining at stages between 632 ft. and 633 ft., and Walter F. George Lake stable or slightly falling to around 188.5 ft. over the next couple of weeks, with both lakes just below Zone 2. Lake Seminole could also drop to just above 76.0 ft.

4. Ted and Charlie expressed concern about river stages dropping to the 8000 cfs range, especially during the month of May which represents the peak of spawning for multiple fish spp. on the river. They requested that the 9100 cfs release from Jim Woodruff be sustained as long as possible and that any draw downs on the river continue to be as gradual as possible. Cheryl and Memphis agreed that we would attempt to sustain the 9100 cfs release through this weekend, which would allow us to monitor how much if any rainfall was received in the basin. We would then revisit on Monday to determine the impacts of rainfall

on the lakes and monitor basin inflows, and then determine whether we need to reduce releases below 9000 cfs.

5. We also discussed the minimal flow needs for various fish spp. on the river. Ted noted that when below 14,000 cfs and especially between 6000 cfs and 11,000 cfs, large areas of floodplain habitat become disconnected from the river. Below the 9000 cfs flow, Charlie and Ted noted that significant quantities of habitat area are no longer accessible, and that at 8,500 to 8000 cfs access to thermal refuge areas by striped bass becomes restricted. Stripers are generally confined to these thermal refuge areas in the hot summer months, and drawdowns below 8000 cfs would significantly impact usage of the areas and affect survivability of the fish. Pulses of 1 to 2 days duration, and return to previous or higher flows as quickly as possible, were agreed to be acceptable, at least later in the summer months, since it takes 5-7 days for the fish to complete a spawn that would be impacted by the drawdown. However, during May it was recommended that any drawdown on the river be as gradual as possible.

6. The next Fish Spawn Coordination teleconference is scheduled for Monday, 17 May, 9:00 a.m. CDT / 10:00 a.m. EDT.

Matthew J. Lang
Biologist
Inland Environment Team

Enclosure 22

Memorandum for Record
Informal Consultation Telecon
17 May 2004

CESAM-PD-EI 17 May 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 17 May 2004

1. The following agency representatives participated in this week's teleconference:

Jerry Ziewitz, US Fish and Wildlife Service, Panama City, FL
Russ Ober, Georgia Dept. of Natural Resources, Albany, GA
Memphis Vaughan, USACE, Mobile, Water Management Section
Cheryl Hrabovsky, USACE, Mobile, Water Management Section
Rob Erhardt, Meteorologist, USACE, Mobile, Water Management Section
Matt Lang, USACE, Mobile, Planning and Environmental Division
Joanne Brandt, USACE, Mobile, Planning and Environmental Division

We attempted to contact Ted Hoehn and Charlie Mesing of Florida Fish and Wildlife Conservation Commission (FWCC) for the teleconference, but both were out of the office. However, the USACE representatives were able to get Rick Long of FWCC online after this telecon to summarize the agency discussions.

2. Joanne summarized the results of last week's teleconference. Our water management staff had planned to reduce outflows from Jim Woodruff Dam (JWD) to the Apalachicola River last week, in anticipation of continued dry conditions and reduced inflows into the basin. However, it was agreed to maintain the 9100 cfs minimum release out of JWD through today to see if any beneficial rainfall would be received in the basin over the weekend, and to reassess the basin inflows. Without the additional rainfall the 9100 cfs release from JWD could not be sustained without impacts to the system resulting in drawing down the upstream reservoirs.

3. Rob noted that there had been little if any rainfall over the ACF basin last week and this past weekend. There would be only spotty and scattered showers over the net 2 days, and then a hot dry pattern would continue for the next 10 days, as a ridge of high pressure strengthens over the southeast and particularly over Georgia. We seem to be experiencing the summer weather patterns several weeks early this year.

4. Russ reported that several fish kills (primarily bass) had been experienced at Walter F. George Lake (WFG) over the last couple of weeks. They are planning to collect fish to send to the lab for analysis, but it appears that this may be a virus infection similar to that experienced several years ago. Russ requested that elevations at WFG be kept as steady as possible in order to avoid any additional stress to the fish. He would not like to see any further draw-down in lake levels at WFG.

5. Cheryl reported that we had continued to make the minimum 9100 cfs release from JWD, but that the 3-day average inflows were currently between 8200 and 8300 cfs. It was proposed to

immediately begin to reduce releases from JWD to match the system inflows, with releases to be gradually reduced (500 cfs per day) to 8200 cfs. With this reduction in releases from JWD, lake levels at WFG would remain steady at around 188.4 ft. and West Point Lake levels would remain steady at around 633 ft. This would bring both lakes to levels just below Zone 2 over the next couple of weeks. This reduced release would be able to be maintained for approximately one week. However, we would then need to re-evaluate system inflows and may need to make a further reduction in releases next week to around 7000 cfs., depending on inflows and any additional beneficial rainfall.

6. Jerry repeated that we should continue to try to keep lakes steady (especially WFG to alleviate fish stress) and to match outflows to the basin inflows. This would be in keeping with the gradual reduction in flows to the Apalachicola River to 8200 cfs over the next couple of days.

7. We will continue to monitor inflows and basin conditions over the next week. The next teleconference is scheduled for Monday, 25 May 2004, 9:00 a.m. CDT/10:00 a.m. EDT.

JOANNE BRANDT
Inland Environment Team

MATT LANG
Inland Environment Team

Enclosure 23

Memorandum for Record
Informal Consultation Telecon
24 May 2004

CESAM-EN-HW 25 May 2004

MEMORANDUM FOR RECORD

SUBJECT: Fish Spawn Coordination Teleconference, 24 May 2004

1. The following agency representatives participated in this week's teleconference:

Jerry Ziewitz, US Fish and Wildlife Service, Panama City, FL
Charlie Mesing, Florida Fish and Wildlife Conservation Commission
Russ Ober, Georgia Dept. of Natural Resources, Albany, GA
Brent Hess, Georgia Dept. of Natural Resources, West Point Lake contact
Cheryl Hrabovsky, USACE, Mobile, Water Management Section
Rob Erhardt, Meteorologist, USACE, Mobile, Water Management Section
Larry Henderhott, USACE, Mobile, Operations Division

We attempted to contact Ted Hoehn Florida Fish and Wildlife Conservation Commission (FWCC) for the teleconference, but he was out of the office. However, the USACE representatives left a message and were able to get Charlie Mesing with FWCC online for the teleconference.

2. Cheryl summarized the results of last week's teleconference. Our water management staff reduced outflows from Jim Woodruff Dam (JWD) to 8200 cfs to the Apalachicola River last week, due to continued dry conditions and reduced inflows into the basin.

3. Rob forecasted no rain for the next week and continued hot and dry conditions.

4. Russ reported that several fish kills (primarily bass) had been experienced at Walter F. George Lake (WFG) over the last three weeks. They have collected some fish and sent them to the lab at Auburn for analysis. It is now thought that the problem is not a virus. Russ requested that elevations at WFG be kept as steady as possible in order to avoid any additional stress to the fish. He would not like to see any further draw-down in lake levels at WFG.

5. Cheryl reported that we had continued to make the minimum 8200 cfs release from JWD, but that the 3-day average inflows were currently between 8000 and 8200 cfs and dropping. It was proposed to begin to reduce releases from JWD starting on Tue, to match the system inflows, with releases to be gradually reduced (500 cfs per day) to 7200 cfs. With this reduction in releases from JWD, lake levels at WFG would remain steady at around 188.4 ft. and West Point Lake levels would remain steady at around 633.9 ft. This reduced release would be able to be maintained for approximately one week. However, we would then need to re-evaluate system inflows and may need to make a further reduction in releases next week to around 6000 cfs., depending on inflows.

6. Larry added that this weekend is a big holiday weekend for recreation at all of our lakes, and the recreational groups would like to see the lakes full. This is for both the recreational benefits and the safety of those using our lakes. At lower elevations, more rocks, etc are exposed or have little clearance for the many boaters posing increased safety concerns. Of course, they all understand the need for flows to the river for the fish and are fine with keeping the lakes steady. They do not want to see any more declines before or during the holiday weekend.

6. Jerry repeated that we should continue to try to keep lakes steady (especially WFG to alleviate fish stress) and to match outflows to the basin inflows. This would be in keeping with the gradual reduction in flows to the Apalachicola River to 7200 cfs over the next couple of days.

7. We will continue to monitor inflows and basin conditions over the next week. The next teleconference is scheduled for Tuesday, 1 Jun 2004, 10:30 a.m. CDT/11:30 a.m. EDT.

CHERYL HRABOVSKY
ACF Basin Manager
Water Management Section

Enclosure 24

Memorandum for Record
Informal Consultation Telecon
11 May 2005

CESAM-PD-EI 11 May 2005

MEMORANDUM FOR RECORD

SUBJECT: Informal Section 7 Consultation Regarding ACF Water Management Operations and Gulf Sturgeon Spawning Activities

1. A teleconference was held with the U.S. Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWCC) to discuss the progress of operations in support of fish spawn activities on the Apalachicola River, and concerns for minimizing impacts to ongoing Gulf sturgeon spawning on the upper river. The following representatives participated in the teleconference discussions:

Jerry Ziewitz, USFWS
Ted Hoehn, FWCC
Charlie Mesing, FWCC
Memphis Vaughan, CESAM-EN-HW
Gene Morisani, CESAM-EN-HW
Cheryl Hrabovsky, CESAM-EN-HW
Ken Day, CESAM-OP-TR
Matt Lang, CESAM-PD-EI
Joanne Brandt, CESAM-PD-EI

2. Initial concern was raised by FWCC that river stages were beginning to drop rapidly during the designated river spawning period (between 1 April and 1 June). Also, Gulf sturgeon spawning habitat could begin to be impacted by river flows less than 18,000 cfs, which equates to Blountstown gage stages between 8 and 9 feet. Because of current dry conditions in the basin, and projected continued dry conditions over the next couple of weeks, there was concern that river stages could drop as low as 7 feet in the next couple of weeks. The projected lower stages could result in impacts to spawning habitat availability immediately below Jim Woodruff Dam. (See attached email coordination that explains the projected conditions in the basin.) Therefore, informal consultation was initiated by means of this teleconference to assure that the Corps' operations would be conducted in a manner that would minimize or avoid impact to Gulf sturgeon spawning habitat or spawning activities.

3. Jerry Ziewitz noted that continued drops in the river stages would begin to impact accessibility or availability of spawning habitat to sturgeon during optimum spawning conditions. Jerry also reminded the Mobile District that since we have not completed formal Section 7 consultation on the existing water control operations, there was no determination at this time of an acceptable number of takings that could occur due to water management operations. Therefore, any takings due to discretionary actions by the Corps would be considered an unauthorized taking under the Endangered Species Act. However, if the Corps operations would result in releases to the river equal to or exceeding the basin inflows, as agreed to last year during extreme low flow conditions, any impacts on spawning habitat or sturgeon spawning activities would be considered the result of naturally declining river flows rather than a

discretionary action on the part of the Corps water management operations. Any augmentation above the basin inflows would be considered a benefit to the Gulf sturgeon critical habitat and to the success of Gulf sturgeon spawning activities. The spawning operations strategy that was established for low flow conditions during the 2004 spawning period provided for releases from Jim Woodruff Dam that equal or exceed the computed basin inflows, as computed from the 3-day average basin inflows.

4. The Mobile District agreed that they had already been implementing this operations strategy (releases equal or exceed inflows, similar to run-of-river operations) as inflows in the basin have begun to decline. However, we have reduced releases gradually so there would be no dramatic decline in river flows (less than ½ foot per day once flows are 20,000 cfs of less). Because of balancing releases with basin inflows, we do not expect Walter F. George Lake or West Point Lake to refill this spring, unless we receive additional rainfall in the basin. We planned to operate conservatively under this strategy as dry conditions continue through the remainder of the spawning period. River stage today is approximately 9.9 feet on Blountstown gage. Stages would likely be around 8 feet by middle of next week.

5. Jerry agreed to share monitoring information on the progress of Gulf sturgeon spawning activities. To date, only 2 of 15 tagged fish have been detected at the known spawning habitat area immediately below Jim Woodruff Dam. Because water temperatures are currently around 21^{o} C, and the sturgeon are known to spawn in temperatures as high as 23.9^{o} C, it is anticipated the sturgeon could continue to spawn for the next couple of weeks. An additional 4 sturgeon were detected in the lower river and apparently have not yet moved up river to spawn. Efforts are continuing to locate the remaining 9 tagged fish. USFWS will continue to share their monitoring data over the next few weeks. Mobile District agreed to get back to USFWS if there was any change from this agreed-to operations plan.

5. It was agreed that the memorandum of this teleconference discussion and the agreement to implement the low flow operations strategy (i.e., releases from JWD will equal or exceed basin inflows), will sufficiently document our informal consultation, with a determination that implementation of the low flow operations strategy would not constitute a discretionary action by the Corps with an impact to Gulf sturgeon spawning activities. Any impact to critical habitat or Gulf sturgeon spawning activities due to implementation of this strategy would be considered an impact of the naturally declining river stages. No takings of sturgeon by the Corps would occur from the implementation of this low flow operations strategy.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Enclosure 25

FWS-COE Email
Concurrence with Informal Consultation
12 May 2005

Brandt, Joanne U SAM

From: Brandt, Joanne U SAM
Sent: Thursday, May 12, 2005 9:19 AM
To: 'Jerry_Ziewitz@fws.gov'
Cc: Zettle, Brian A SAM; Peck, Brian E SAM; Hrabovsky, Cheryl L SAM; Flakes, Curtis M SAM; Findley, Diane I SAM; Morisani, Eugene A SAM; Day, Kenneth SAM; Bradley, Kenneth P SAM; Lang, Matthew J SAM; Vaughan, Memphis Jr SAM
Subject: RE: FW: Memorandum for Record, Informal Consultation pursuant to Section 7 of ESA, Gulf sturgeon and ACF water management operations

Thanks for the update. It will be interesting to see what happens over the next week or so with the lower stages and warmer temperatures. We will keep you posted of any changes in projected river stages.

Joanne

-----Original Message-----
From: Jerry_Ziewitz@fws.gov [mailto:Jerry_Ziewitz@fws.gov]
Sent: Thursday, May 12, 2005 8:25 AM
To: Brandt, Joanne U SAM
Cc: Zettle, Brian A SAM; Peck, Brian E SAM; Hrabovsky, Cheryl L SAM; Flakes, Curtis M SAM; Findley, Diane I SAM; Morisani, Eugene A SAM; Day, Kenneth SAM; Bradley, Kenneth P SAM; Lang, Matthew J SAM; Vaughan, Memphis Jr SAM
Subject: Re: FW: Memorandum for Record, Informal Consultation pusuant to Section 7 of ESA, Gulf stugeon and ACF water management operaitons

Joanne,

The memo accurately describes the conference call yesterday. Thanks for the prompt and thorough documentation.

Our people on the river yesterday located two additional radio-tagged fish in the river upstream of Blountstown (one at rm 92, the other near the Sneads boat ramp). One of the two that had been in the upper river for the past few weeks has apparently moved downstream, while the other is back at the dam. Water temperature was 22.6 C.

Jerry

Brandt, Joanne U SAM

From: Brandt, Joanne U SAM

Sent: Wednesday, May 11, 2005 4:50 PM

To: Jerry_Ziewitz@fws.gov

Cc: Lang, Matthew J SAM; Zettle, Brian A SAM; Peck, Brian E SAM; Findley, Diane I SAM; Bradley, Kenneth P SAM; Flakes, Curtis M SAM; Vaughan, Memphis Jr SAM; Morisani, Eugene A SAM; Hrabovsky, Cheryl L SAM; Day, Kenneth SAM

Subject: FW: Memorandum for Record, Informal Consultation pusuant to Section 7 of ESA, Gulf stugeon and ACF water management operaitons

Attachments: MFR_SturgeonInformalConsultation_05-11-04.doc; Email_RiverStages_05-10-05.pdf

Here in addition to the MFR is the referenced email correspondence which included the 3-day moving average of basin inflows from 05-09-05. The current 3-day average basin inflows can be found at the following web link: http://water.sam.usace.army.mil/acf_flow.htm

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From: Brandt, Joanne U SAM
Sent: Wednesday, May 11, 2005 4:27 PM
To: Jerry_Ziewitz@fws.gov
Cc: Lang, Matthew J SAM; Zettle, Brian A SAM; Peck, Brian E SAM; Findley, Diane I SAM; Bradley, Kenneth P SAM; Flakes, Curtis M SAM; Vaughan, Memphis Jr SAM; Morisani, Eugene A SAM; Hrabovsky, Cheryl L SAM; Day, Kenneth SAM
Subject: Memorandum for Record, Informal Consultation pusuant to Section 7 of ESA, Gulf stugeon and ACF water management operaitons

Jerry:

Here is a Memorandum For Record (MFR) of our teleconference discussions this morning. This MFR serves as documentation of informal Section 7 consultation pursuant to the Endangered Species Act. We agreed to implement the low flow operations strategy, as developed during extended extreme low flow conditions in the spring of 2004. Under the low flow operations strategy, we will continue to compute the 3-day moving average for basin inflows and will release from Jim Woodruff Dam to the Apalachicola River flows that equal or exceed the 3-day average basin inflow. You agreed that implementation of this operation strategy would approximate natural flow conditions in the basin, and that any impacts to Gulf sturgeon from this operation strategy would be considered impacts due to naturally declining river stages rather than a consequence of a discretionary action by the Corps' water management operations.

Please review the attached MFR and let me know if you agree with this documentation of our informal consultation discussions.

Thanks,

Joanne

CESAM-PD-EI 11 May 2005

MEMORANDUM FOR RECORD

SUBJECT: Informal Section 7 Consultation Regarding ACF Water Management Operations and Gulf Sturgeon Spawning Activities

1. A teleconference was held with the U.S. Fish and Wildlife Service (USFWS) and Florida Fish and Wildlife Conservation Commission (FWCC) to discuss the progress of operations in support of fish spawn activities on the Apalachicola River, and concerns for minimizing impacts to ongoing Gulf sturgeon spawning on the upper river. The following representatives participated in the teleconference discussions:

Jerry Ziewitz, USFWS
Ted Hoehn, FWCC
Charlie Mesing, FWCC
Memphis Vaughan, CESAM-EN-HW
Gene Morisani, CESAM-EN-HW
Cheryl Hrabovsky, CESAM-EN-HW
Ken Day, CESAM-OP-TR
Matt Lang, CESAM-PD-EI
Joanne Brandt, CESAM-PD-EI

2. Initial concern was raised by FWCC that river stages were beginning to drop rapidly during the designated river spawning period (between 1 April and 1 June). Also, Gulf sturgeon spawning habitat could begin to be impacted by river flows less than 18,000 cfs, which equates to Blountstown gage stages between 8 and 9 feet. Because of current dry conditions in the basin, and projected continued dry conditions over the next couple of weeks, there was concern that river stages could drop as low as 7 feet in the next couple of weeks. The projected lower stages could result in impacts to spawning habitat availability immediately below Jim Woodruff Dam. (See attached email coordination that explains the projected conditions in the basin.) Therefore, informal consultation was initiated by means of this teleconference to assure that the Corps' operations would be conducted in a manner that would minimize or avoid impact to Gulf sturgeon spawning habitat or spawning activities.

3. Jerry Ziewitz noted that continued drops in the river stages would begin to impact accessibility or availability of spawning habitat to sturgeon during optimum spawning conditions. Jerry also reminded the Mobile District that since we have not completed formal Section 7 consultation on the existing water control operations, there was no determination at this time of an acceptable number of takings that could occur due to water management operations. Therefore, any takings due to discretionary actions by the Corps would be considered an unauthorized taking under the Endangered Species Act. However, if the Corps operations would result in releases to the river equal to or exceeding the basin inflows, as agreed to last year during extreme low flow conditions, any impacts on spawning habitat or sturgeon spawning activities would be considered the result of naturally declining river flows rather than a

discretionary action on the part of the Corps water management operations. Any augmentation above the basin inflows would be considered a benefit to the Gulf sturgeon critical habitat and to the success of Gulf sturgeon spawning activities. The spawning operations strategy that was established for low flow conditions during the 2004 spawning period provided for releases from Jim Woodruff Dam that equal or exceed the computed basin inflows, as computed from the 3-day average basin inflows.

4. The Mobile District agreed that they had already been implementing this operations strategy (releases equal or exceed inflows, similar to run-of-river operations) as inflows in the basin have begun to decline. However, we have reduced releases gradually so there would be no dramatic decline in river flows (less than ½ foot per day once flows are 20,000 cfs of less). Because of balancing releases with basin inflows, we do not expect Walter F. George Lake or West Point Lake to refill this spring, unless we receive additional rainfall in the basin. We planned to operate conservatively under this strategy as dry conditions continue through the remainder of the spawning period. River stage today is approximately 9.9 feet on Blountstown gage. Stages would likely be around 8 feet by middle of next week.

5. Jerry agreed to share monitoring information on the progress of Gulf sturgeon spawning activities. To date, only 2 of 15 tagged fish have been detected at the known spawning habitat area immediately below Jim Woodruff Dam. Because water temperatures are currently around 21^{o} C, and the sturgeon are known to spawn in temperatures as high as 23.9^{o} C, it is anticipated the sturgeon could continue to spawn for the next couple of weeks. An additional 4 sturgeon were detected in the lower river and apparently have not yet moved up river to spawn. Efforts are continuing to locate the remaining 9 tagged fish. USFWS will continue to share their monitoring data over the next few weeks. Mobile District agreed to get back to USFWS if there was any change from this agreed-to operations plan.

5. It was agreed that the memorandum of this teleconference discussion and the agreement to implement the low flow operations strategy (i.e., releases from JWD will equal or exceed basin inflows), will sufficiently document our informal consultation, with a determination that implementation of the low flow operations strategy would not constitute a discretionary action by the Corps with an impact to Gulf sturgeon spawning activities. Any impact to critical habitat or Gulf sturgeon spawning activities due to implementation of this strategy would be considered an impact of the naturally declining river stages. No takings of sturgeon by the Corps would occur from the implementation of this low flow operations strategy.

JOANNE BRANDT
Compliance Manager
Inland Environment Team

Brandt, Joanne U SAM

From: Lang, Matthew J SAM

Sent: Tuesday, May 10, 2005 8:49 AM

To: Jerry_Ziewitz@fws.gov; Ted.Hoehn@fwc.state.fl.us

Cc: Brandt, Joanne U SAM; Findley, Diane I SAM; Bradley, Kenneth P SAM; Flakes, Curtis M SAM; Vaughan, Memphis Jr SAM; Morisani, Eugene A SAM; Hrabovsky, Cheryl L SAM

Subject: FW: River stage dropping fast

Attachments: LOCALS.pdf

Ted/Jerry:

Below you will find the correspondence we received from our water management team in response to Ted's email concerning water levels on the Apalachicola River.

We will continue to monitor rainfall and system inflows, but if we anticipate the river going below the 8-9 foot stage, we would like to set up a teleconference with you both and any other interested parties. These teleconferences would be similar to the ones we have conducted in the past. I have also attached a 3-day average inflow chart.

Based off of the information below, would you like to try to set up a call for tomorrow, 5/11/05 starting between 10:30-10:45 cst?

Matt

Matthew J Lang
Biologist
US Army Corps of Engineers
Mobile District
(251) 694-3837 office
(251) 694-3815 fax
email: matthew.j.lang@sam.usace.army.mil

From: Morisani, Eugene A SAM
Sent: Monday, May 09, 2005 12:24 PM
To: Brandt, Joanne U SAM
Cc: Vaughan, Memphis Jr SAM; Lang, Matthew J SAM; Hrabovsky, Cheryl L SAM
Subject: RE: River stage dropping fast

The 1.5 foot per day drops in the last few days were the result of a tough decision process we had to make last week. The last 9 days have been a pretty dry period that saw basin inflow drop from over 40,000 cfs on May 1, to about 20,000 cfs currently. We would like to have been more gradual, but local inflow dropped out and we had to decide how to balance the system outflow with all the different demands this time of year. Since we were at about a 15 foot Blst. gage last week, we determined that making bigger cuts early to get to 22,000 cfs, a more manageable outflow, was the best option. The other option was to try and keep the cuts below 1 foot per day over the weekend, but risk those same 1 foot cuts below the the 9-10 foot range. This was all based on the fact that we did still have some storage above the guide curve at West Point and George. When we looked at both options we decided not to use that water to reduce the fall rate initially, but instead use that water once we got to the 20,000 cfs range. Today we are within 2-4 days of being at or below Guide Curve on our upstream reservoirs.

If the current forecast which calls for about an inch of rain this week comes true the river would hold in the 9 - 10 foot range at Blst. through the weekend. Out 10 days we would have to see a change in the weather pattern, back to wetter than normal, to be able to stick to that 9 foot through the 21st projection. More than likely we will be in the 8 foot range by the 21st.

If we don't get any rain greater than spotty afternoon thunderstorms this week we will most likely be in the 9 foot range by Friday and the 7-8 foot range next week.

Regardless of how the rain pans out we will be shooting for that half a foot per day threshold from here on out when we have to cut, just as we have done in at least the last 3-4 years.

As for our refilling situation, Lanier is at 1071 and is augmenting flow on the system, West Point and George are close but will need rain to get there. Woodruff is holding what water it can to help us with step down on the river now that we are in the critical range.

Let me know if there are any questions.

Gene Morisani
Water Management Section
U.S. Army Corps of Engineers, Mobile District
251-690-3385

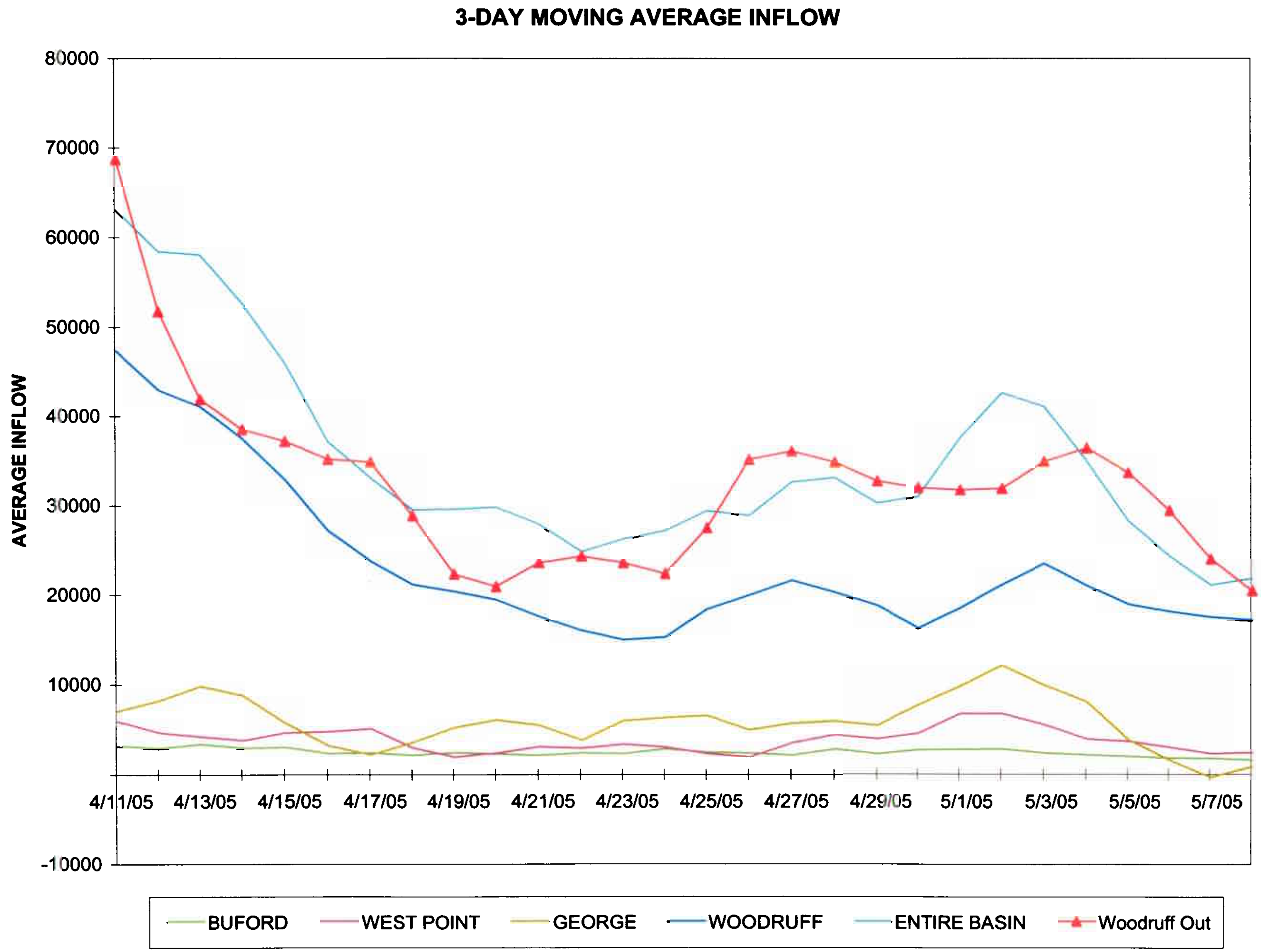
From: Brandt, Joanne U SAM
Sent: Monday, May 09, 2005 10:15 AM
To: Morisani, Eugene A SAM; Hrabovsky, Cheryl L SAM
Cc: Vaughan, Memphis Jr SAM; Lang, Matthew J SAM
Subject: FW: River stage dropping fast

fyi. We probably need to discuss the appropriate response to Ted, and whether we need any additional consultation with USFWS. I understood from Gene last week that we plan to maintain a 9-foot stage or greater at least through 21 May???

Joanne

From: Hoehn, Ted [mailto:ted.hoehn@MyFWC.com]
Sent: Monday, May 09, 2005 9:51 AM
To: Vaughan, Memphis Jr SAM; Brandt, Joanne U SAM; Lang, Matthew J SAM
Cc: Mesing, Charles; Graham; jerry_ziewitz@fws.gov; Lee.Edmiston@dep.state.fl.us
Subject: River stage dropping fast

Memphis- noticed that the river has dropped fast over the past three days. I recognize that you are still trying to fill the upstream reservoirs and are ahead of the rule curve by a week or so. I also know that we had previously said that dropping faster than 0.5 ft/day when above 12ft at Blountstown was OK, but we are now moving into the 10ft at Blountstown range and flows have been dropping over a 1.5 feet per day. I know that Franklin County has been complaining about the "high flows" over the past week, but as I explained to them on Friday, the high water was due to rainfall in the basin, is normal part of the cycle, the Chipola was high too, and that high water typically occurred several weeks earlier than we had this year, but that was nature. Since flows are around 22,700 cfs at Chattahoochee and Sturgeon still appear to be spawning, are you anticipating holding the flow at this level for the next week or so? Everything seems to be delayed in spawning by at least two to three weeks or more with the cooler river water and daytime temps that we have had over the past month. If it is anticipated that flows are going to drop at the same rate or further than current water levels, we will need to talk some since we are still in the fish spawn window. Thanks for your consideration.



3-DAY MOVING AVERAGE INFLOW
AVERAGE INFLOW
80000
70000
60000
50000
40000
30000
20000
10000
-10000
4/11/05
4/13/05
4/15/05
4/17/05
4/19/05
4/21/05
4/23/05
4/25/05
4/27/05
4/29/05
5/1/05
5/3/05
5/5/05
5/7/05
BUFORD
WEST POINT
GEORGE
WOODRUFF
ENTIRE BASIN
Woodruff Out

Enclosure 26

COE-FWS Email
Informal Consultation
17 May 2005

Brandt, Joanne U SAM

From: Brandt, Joanne U SAM
Sent: Tuesday, May 17, 2005 11:38 AM
To: 'Jerry_Ziewitz@fws.gov'
Cc: Zettle, Brian A SAM; Peck, Brian E SAM; Hrabovsky, Cheryl L SAM; Flakes, Curtis M SAM; Findley, Diane I SAM; Morisani, Eugene A SAM; Day, Kenneth SAM; Bradley, Kenneth P SAM; Lang, Matthew J SAM; Vaughan, Memphis Jr SAM; Hoehn, Ted; Mesing, Charles; Gail_Carmody@fws.gov
Subject: RE: Update sturgeon spawning Apalach

Jerry:

Thanks for the updates. As we agreed last week, we operating in the "run of river" mode due to drying conditions in the basin. We can continue to do so through 1 June. Conditions are continuing to be very dry, with very little rainfall received over the weekend. River stages on Monday were between 8 and 9 feet at BlountstownAt this time river stages are projected to fall gradually to approximately 7 feet by the end of this week. I'll have to get with you later this week to see what the further projections would be by the end of the month. But at this time it looks very dry with stages continuing to gradually fall.

Are you still planning to look for the other tagged sturgeon?

Joanne

-----Original Message-----
From: Jerry_Ziewitz@fws.gov [mailto:Jerry_Ziewitz@fws.gov]
Sent: Tuesday, May 17, 2005 10:28 AM
To: Brandt, Joanne U SAM
Cc: Zettle, Brian A SAM; Peck, Brian E SAM; Hrabovsky, Cheryl L SAM; Flakes, Curtis M SAM; Findley, Diane I SAM; Morisani, Eugene A SAM; Day, Kenneth SAM; Bradley, Kenneth P SAM; Lang, Matthew J SAM; Vaughan, Memphis Jr SAM; Hoehn, Ted; Mesing, Charles; Gail_Carmody@fws.gov
Subject: Update sturgeon spawning Apalach

Joanne,

We checked our egg sampling pads on the river Friday 5/13 and Monday 5/16. Water temperature was 23.8 C on Friday, and 24.3 C on Monday. We collected five more eggs on Friday from the rock shoals site, and none from the Aspalaga Bluffs (downstream of I-10) site. Two of these eggs hatched in our lab sometime between 10:00 am Saturday and 6:30 am Monday, which I confirmed were sturgeon larvae before leaving for the river.

Only one of the radio tagged fish was present upstream of Aspalaga Bluffs on Friday, one which has been in that area for several weeks now. This fish was not detected Monday, but another tagged fish was detected at the dam, one which was located at rm 66 on 5/04. Because the water temperature now exceeds the highest temperature at which eggs have been collected in all previous studies (23.9 C) and no new eggs were found Monday, we pulled the pads. Lab studies have shown that gamete and egg development are compromised at temperatures greater than 25 C.

It appears that sturgeon spawning on the river has likely concluded, but it is also likely that larvae are present on the rock shoals, given the collection of eggs last Friday. Gulf sturgeon larvae probably remain at the spawning site for the first week or two after hatching, hiding in the crevices of the rock and gravel substrate before dispersing. To maintain the shoals as a habitat for these larvae, I recommend continuing the "run-of-river" mode of operations at least until the end of the month, May 31, when eggs spawned at the same time as the last eggs we collected should develop to a free-swimming stage ready for dispersal off the shoals. On Monday, the highest portions of the shoal were visible above water for the first time in our work this season, and pads from which we had previously collected eggs or observed the cases of hatched eggs were retrieved from depths as shallow as 1.5 ft.

Enclosure 27

Memorandum for Record
Gulf Sturgeon Spawning Habitat Survey and Mapping
23-23 October 2002

CESAM-PD-EI 31 October 2002

MEMORANDUM FOR RECORD

SUBJECT: Gulf Sturgeon Spawning Habitat on the Apalachicola River – Initiation of Habitat Survey and Mapping, 22-23 October 2002

1. The Mobile District has agreed to consult with the USFWS on the effects of current water control operations on Gulf sturgeon spawning activities. USFWS has expressed concern that significant Gulf sturgeon spawning habitat located below Jim Woodruff Dam became exposed during extreme low flow stages experienced in the Spring of 2002. Identification of the areal extent and relative depth of sturgeon spawning habitat will assist in preparation of a biological assessment as part of Section 7 consultation under the Endangered Species Act. Collection of cross-sections at spawning habitat areas referenced to controlled elevation will provide information on relative depth of habitat areas. This data can be related to flow/stage rating information to determine extent of habitat inundated at various flow/stage regimes. This information can then be used in an assessment of water management operations during extended drought or low flow conditions to determine the effect on the Gulf sturgeon spawning activities.

2. On 22 October, Terry Jangula, Panama City Site Manager, and members of the U.S. Army Corps of Engineers, Mobile District (CESAM), Panama City Site Office survey crew (led by Danny Freeman) met with Joanne Brandt (CESAM-PD-EI) and Jerry Ziewitz of the U.S. Fish and Wildlife Service (USFWS), Panama City Field Office, to establish an acceptable protocol for surveying and mapping of Gulf Sturgeon spawning habitat on the upper Apalachicola River. Gulf sturgeon utilize hard bottom habitat areas for spawning activities, in particular substrates with irregular surfaces that provide attachment for sturgeon eggs and shelter for non-free swimming larval stages. Preferred habitat areas are comprised of lime rock ledges, hard clay substrates, and gravel bars in areas of sufficient flow to wash the surface clean of sediments and debris, but with currents not so swift that the eggs or larvae would be washed off the site. USFWS had previously identified the following seven locations of suspected suitable habitat between Jim Woodruff Dam and Bristol, Florida:

Site 1: NM 104.5 5o NM 106.5 at base of Jim Woodruff Dam
Site 2: NM 100.2 to NM 100.3, immediately above I-10 bridge
Site 3: NM 98.7 to Nm 99.3, below I-10 bridge
Site 4: Approximate NM 93.5, below Ocheesee Landing
Site 5: NM 92.3 to NM 92.6 at Rock Bluff Landing
Site 6: NM 83.8 to NM 84.4 at Alum Bluff
Site 7: NM 80.4 to NM 81.2 above Bristol Boat Ramp

In addition to these seven general locations, the Mobile District had identified several additional possible rock habitat areas, which were clearly noted as possible navigation hazards on the Apalachicola River Charts based on photography taken in 1985 and 1993, or known from previous rock removal efforts undertaken in the 1980s related to maintenance of the Federal navigation channel. These additional potential habitat areas include the following locations:

NM 103.3 – 103.2 (left bank and right bank), near mouth of Jackson County Port Canal
NM 103.1 – 103.0 (right bank) at Banks Landing
NM 101.0 – 100.9 (left bank) at Disposal Area 147A
NM 95.2 – 95.0 (left bank)
NM 94.0 - -93.2 (right bank)
NM 86.1 (left bank)

3. We began by conducting a “recon” survey effort to locate each of the above potential spawning habitat areas and identifying the upstream and downstream boundaries of the “study area” for each site. We then described the relative location (right bank or left bank) and type of habitat, and recommended the relative number of survey cross-sections and/or spacing of cross-sections to be taken through each habitat area. It was agreed to follow-up at a future date to map the areal extent of the each habitat area (upstream and downstream boundaries, and waterward extent of rock ledge or hard bottom substrate) using a Ponar sampling device or other suitable means. GPS coordinates would at that time be collected by the team for each of the points defining the areal extent of the site. Coordinates for the boundaries of the delimited sites be superimposed on the survey drawings to assist in preparing the surveyed maps.

4. On 23 October, Jerry and I were joined by Marilyn Phipps, Mobile District Public Affairs Officer, in efforts to characterize the bottom substrate for a number of the sites using the Ponar sampler and to develop recommended procedures for mapping the sites at a future date. Attached are sketched maps showing the location of each site and the minimum number of cross-sections agreed to for each site; as well as a summary of the bottom characteristics for those sites sampled. The Ponar sampler was successful in identifying the bottom substrate (hard bottom, gravel bottom or sand/silt bottom) in most cases. However, at least one or two locations within Site 1 appeared to provide diverse habitat (i.e., sand bottom interspersed with rock outcroppings) and may require the use of divers or other means to more clearly characterize the site(s) and determine suitability for spawning habitat.

5. The Panama City Site Office survey crew will collect cross-sections and prepare survey maps for the above sites as described in this MFR. Cross-sections will extend across the entire river channel and up the bank within rock ledge areas; using hydro and terrestrial survey techniques as necessary. A follow-on site mapping effort will be scheduled with Jerry Ziewitz, Joanne Brandt and the Panama City Site Office survey crew to map the upstream and downstream boundaries and areall extent for each of the sites, hopefully during the weeks of 4 November and/or 11 November. In the meantime, Jerry agreed to consult fishery experts familiar with Gulf sturgeon spawning habitat requirements for additional guidance on whether a particular substrate type would provide suitable spawning habitat.

Attachments

JOANNE BRANDT
Biologist/Compliance Manager
Inland Environment Team

CF:

Jangula/Freeman/CESAM-OP-GE
Peck/Findley/CESAM-PD-EI
McClellan/CESAM-PD-E
Ziewitz/USFWS, Panama City Field Office

Field Notes
Potential Sturgeon Spawning Habitat Areas
22-23 October 2002

<u>Site 1:</u>
Upstream boundary: NM 106.5
Downstream boundary: NM 104.5
Prelim Site Description: Upper reach is cobble gravel bar located on left bank below Jim Woodruff Powerhouse, overlain with <u>Corbicula</u> shells (Asiatic clam), both live and dead shells. Jerry says he previously sampled deeper areas at this site with a Ponar and found only <u>Corbicula</u> shells on the surface. In the mid-1990s when the outer 1/3 portion of this site was removed to correct an adverse cross current at the Jim Woodruff lock approach, the site was comprised of coarse cobble on the surface and supported a diverse community of mussels, although <u>Corbicula</u> populations were increasing. Lower reach is rock ledge on left bank.
Survey Cross-sections: For upper reach of Site 1 (gravel bar), collect a cross-section at the buoy line below the Powerhouse and approximately 3 additional cross-sections through gravel bar, and a cross-section immediately above the U.S. Highway 90 bridge. For lower reach of Site 1 (rock ledge), collect a cross-section at the navigation buoy, and approximately 4 additional cross-sections through the rock ledge between the buoy and the railroad bridge, and an additional cross-section immediately downstream of railroad bridge. Downstream boundary for Site 1 study reach is the upper tip of the island located below the railroad bridge. Map boundary of exposed upstream tip of island only up to treeline to determine elevation and areal extent. No need to extend cross section through island. (Jerry will check with Frank Parauka to determine if he specifically intended to include the upstream tip of the island as suitable sturgeon spawning habitat.)
Ponar Sampling:

NM 106.0 (23 Oct, 9:00 a.m.): Upper reach of Site 1, gravel bar on left bank. A Ponar sample was taken in 1 to 2-foot water depth at a location just east of the gravel bar, and within the tailrace channel cut through the gravel bar. A layer of sand/silt and <u>Corbicula</u> appear to be overlaying the gravel bar. Lots of willow growth (2 to 3 years of age) was observed growing on the surface of gravel bar. This site, as is, does not provide suitable sturgeon spawning habitat due to accumulated silt/sand and dense layer of <u>Corbicula</u> shells on the surface; however, it is possible that a future flood could wash the surface clean of the accumulated sand/silt and re-establish the cobble/gravel substrate.

NM 105.4 (23 Oct, 9:30 a.m.): Lower reach of Site 1, upper end of rock ledge on left bank.
<u>Sample 1</u> taken approx 50 feet from treeline on shore in 9-foot water depth. Ponar collected cobble and <u>Corbicula</u> indicating hard bottom surface.
<u>Sample 2</u> taken 70-100 feet from treeline on left bank and approximately 40 feet east of red can navigation buoy in 10.5-foot water depth. Ponar collected more <u>Corbicula</u> shells and 2” diameter rock.
<u>Sample 3</u> taken even with red can navigation buoy in 10.5-foot water depth. Ponar collected <u>Corbicula</u> shells but no sand. Bottom feels hard; signs of white clay observed on boat anchor.
<u>Sample 4</u> taken midway between red and green can navigation buoys (mid navigation channel) in 11-foot water depth. Ponar collected <u>Corbicula</u> shells and one 2” diameter rock (no sand). Anchor was clean.
<u>Sample 5</u> taken even with green can to approximately 20 feet west of green can on west edge of navigation channel in 9.5-foot water depth (boat was slowly drifting). Ponar collected <u>Corbicula</u> shells and sand.

Conclusion is that this is a hard bottom site extending from the left bank, with edge of exposed rock/hard bottom located somewhere between mid channel and the west edge of the navigation channel at the green can.

NM 105.3 (23 Oct 10:30 a.m.): Continuation of rock ledge on left bank, with boat lined up with iron pipe in the rock. This is the site where Jerry measured water depths in May 2002, demonstrating habitat that was exposed during low flows.

Sample 1 taken approximately 30 feet from exposed edge of rock and approx 20 feet east of red can navigation buoy in 6-foot water depth. Ponar collected Corbicula shells and three 1" to 2" diameter rocks, and a small amount of sand. Anchor was clean.

Sample 2 taken at 10:45 a.m. approximately 30 feet west of red can navigation buoy in 12-foot water depth. First two Ponar samples came up empty; 3rd sample at this location collected 5" to 6" piece of limerock. (Note: Jerry says in May 2002 he observed sand off edge of exposed rock ledge; we are finding rock. Therefore, it is likely there are discontinuous outcroppings of rock extending into the channel.)

Sample 3 taken at 11:15 a.m., lined up with the iron pipe in the rock ledge and the upstream, green can navigation buoy, approximately 100 feet off the west bank of the river, in approximate14-foot water depth. Current is swift in this reach. Ponar collected Corbicula, small amount of gravel and detrital debris. (Note: Due to discontinuous outcroppings and gravel deposits contributing to the complexity of this site, it may be useful to employ divers to characterize this site. Jerry will also consult sturgeon experts to determine whether this type of site would be used by sturgeon for spawning.)

Jackson County Port Canal Site:

Upstream boundary: 103.7

Downstream boundary: 103.0

Prelim Site Description: Right bank rock disposal area on the extending upstream from Jackson County Port canal was used as a rock disposal site for removal of limerock outcroppings occurring within the navigation channel fronting the canal Rock was removed from location fronting the canal in the 1980s. Broken rock pieces placed in this upstream disposal site on the right bank vary from 6" to 8 " in size. Additional outcropping rock was removed from the navigation channel reach located under the power lines near Banks Landing, and placed within a rock disposal area located on the right bank under the overhead power lines. Rock in this disposal site also comprised of broken pieces of limerock.

Survey Cross-sections: Collect two cross-sections through rock disposal site located upstream of canal. Collect a cross-section across river at approximate centerline of canal. Collect two cross sections through rock disposal area located on right bank downstream of canal and under overhead powerlines.

Ponar Sampling (23 Oct 02):

Sample 1 taken at 11:50 a.m. at approx. NM 103.6 near upper section of rock disposal area approximately 50 feet east of green can navigation buoy in 7.5-foot water depth. Ponar collected Coricula shells and dark mucky clay.

Sample 2 taken at 12:00 noon at approx. NM 103.6 closer to edge of rock disposal area in 5.8-foot water depth. Ponar collected Corbicula shells, mucky clay and a 3" diameter chunk of limerock. Concluded that rock disposal area does not extend beyond observable limits (rock was placed on top of soft bottom).

Sample 3 taken at 12:29 p.m. aligned with downstream edge of Jackson County Port Canal at approx. NM 103.2, approximately 25 feet off the left bank in 6.3-foot water depth (downstream edge of rock removal site). First Ponar sample came up empty. Second Ponar sample included

only a 4” diameter chunk of rock. Velocity measured at 1.8 ft/sec. Hard plastic clay observed on the anchor. Concluded this hardbottom habitat.
Sample 4 taken at 12:45 p.m. at NM 103.2 at approximate mid navigation channel in 13-foot water depth. Ponar collected Corbicula shells and clean pea gravel. Jerry took a photo of the Ponar sample. Velocity was measured as 3 ft/sec.
Sample 5 taken at approximately 12:55 p.m. at NM 103.2 near downstream edge of mouth of canal, approximately 50 feet off the right bank in 5.6-foot water depth. Ponar collected Corbicula shells, detrital debris and a dragonfly nymph. Velocity measured at approx. 2 ft/sec. Approximate GPS coordinates: $30^{o}40'15.87"$ N; $84^{o}52'40.30"$ W ($\pm$ 23 feet).
Conclusion is that the rock ledge and hard bottom habitat extends from left bank to somewhere beyond the middle of the river channel.

Disposal Areas 147A on left bank and 147C on right bank:
Upstream boundary: NM 101.1
Downstream boundary: NM 100.9
Prelim Site Description: Apalachicola River Chart shows rock Disposal Area 147A at this location on the left bank and rock Disposal Area 147B on left bank immediately upstream (approx NM 101.3 to 101.5). Disposal Area 147C is designated in the FDEP permit to accept only sand material. Observations on site showed 147C suggested that this site was used as a previous rock disposal area. (Need to confirm nature of this site with bottom samples, etc.)
Survey Cross-sections: Three cross-sections to be taken through rock disposal area delimited within boundaries of Disposal Area 147C
Ponar Sampling: No Ponar sample taken yet at this site.

Site 2:
Upstream boundary: 100.4
Downstream boundary: 100.1
Prelim Site Description: Rock ledge area comprised of hard white clay rock located on right bank immediately upstream of Interstate 10 bridge. Ledge is terraced, indicating that the clay rock was probably removed from navigation channel, and apparently placed along the right bank in a rock disposal area located immediately upstream (see photos in Apalachicola River charts).
Survey Cross-sections: Two cross-sections to be taken through rock ledge area on right bank.
Ponar Sampling (23 Oct):
Sample 1 taken at 1:15 p.m. at approx. NM 100.1 at the edge of the first terrace in 8-foot water depth. Ponar sample collected hard-packed white clay. Velocity measured at approx. 2 ft/sec.
Sample 2 taken at 1:30 p.m. at NM 100.1 approximately 30 feet east of green can navigation buoy (within navigation channel) in 9-foot water depth. Ponar sample was basically empty with small pieces of hard white clay and floating algae.
Sample 3 taken at 1:40 p.m. just downstream of clay ledge outcropping in mid channel in 9-foot water depth. Ponar collected Corbicula shells and coarse gravel.
Sample 4 taken at 1:50 p.m. in mid channel off shore of clay ledge outcropping in 8-foot water depth. Ponar collected Corbicula shells, coarse gravel and sand. Velocity measured at approx. 3 ft/sec.

Site 3 near Aspalaga Landing:

Upstream boundary: NM 99.5 at downstream dike on right bank
Downstream boundary: NM 98.0 at downstream end of Disposal Area 141A
Prelim Site Description: Visible rock ledges along both right and left banks throughout this reach. Fine-ground (pulverized) lime rock also observed in some rock disposal areas along the banks (probably the result of previous blasting for rock removal – Danny Freeman says in early rock removals they blasted and then dug out the blasted/pulverized rock from the channel; in later rock removal effort they just dug out rock in chunks.)
Survey Cross-sections: Collect cross-sections every 500 feet where rock is visible along the shoreline (Minimum of 1 to 2 cross-sections in each observed rock ledge or rock disposal area). For other portions of this reach collect sections at 1000-foot intervals.
Ponar Sampling: No Ponar samples collected yet at this reach.

Rock Shelf at NM 95.2:
Upstream boundary: NM 95.3
Downstream boundary: NM 94.9
Prelim Site Description: Apalachicola River Charts show a rock ledge on left bank between NM 95.0 and 95.2.
Survey Cross-sections: Two cross-sections to be collected through the rock ledge.
Ponar Sampling: No Ponar samples collected yet at this reach.

Site 4 Downstream of Ocheesee Landing:
Upstream boundary: NM 94.0 at Ocheesee Landing boat ramp
Downstream boundary: NM 92.7
Prelim Site Description: Original boundaries of Site 4 designated by USFWS included a small segment at approx. NM 93.4 to NM 93.5. Apalachicola River Charts show an extensive rock ledge on the right bank from NM 94.0 to NM 93.2, and a rock disposal site on the left bank from approx NM 92.7 to NM 93.2 (at downstream end of Disposal Area 135A). It was agreed to extend the Site 4 study limits accordingly to encompass the extension of the rock ledge and the rock disposal area. Downstream boundary of extended Site 4 is therefore contiguous with upstream boundary of Site 5. Rock ledge on right bank just downstream of Ocheesee Landing boat ramp is grey rock ledge extending into river and is overlain with white marl clay.
Survey Cross-sections: Same guidance as for Site 3: take cross-sections at 500-foot intervals where rock ledge or rock disposal area is visible along bank (minimum of 1 or 2 sections through each rock ledge or rock disposal area); and sections at 1000-foot intervals in all other portions of this reach.
Ponar Sampling: No Ponar samples collected yet at this reach.

Site 5, Rock Bluff:
Upstream boundary: NM 92.7
Downstream boundary: NM 92.3
Prelim Site Description: USFWS map shows rock ledge at NM 92.6 to 92.3. It was agreed to extend the upstream boundary to make Site 5 contiguous and continuous with the upstream Site 4 boundary.
Survey Cross-sections: Two sections to be taken through this site.
Ponar Sampling: No Ponar samples collected yet at this reach.

<u>Rock Outcropping at NM 86.1:</u>
Upstream boundary: 86.1
Downstream boundary: 86.0
Prelim Site Description: Rusty colored sandstone/rock outcropping on left bank. Appears as several large boulders clustered and scattered along the bottom.
Survey Cross-sections: One cross-section through this site.
Ponar Sampling: No Ponar samples collected yet at this reach.

<u>Site 6 (Alum Bluff):</u>
Upstream boundary: NM 84.5
Downstream boundary: NM 83.8
Prelim Site Description: Alum Bluff on left bank, comprised of clay, gravel, sand and limestone on the bank; steep, very tall vertical bluff.
Survey Cross-sections: Cross-sections to be taken at 1000-foot intervals throughout this reach. Topo survey to extend up ledges at base of bluff.
Ponar Sampling (22 Oct):
<u>Sample 1</u> taken approx 30 feet off left bank at upstream end of Bluff in approx 17-foot water depth; area of strong current on outside bend of river. Ponar sample indicates hard marl clay on bottom, washed clean due to strong current.
<u>Sample 2</u> taken immediately downstream of rocks in channel. Ponar collected fine and coarse sand.
<u>Sample 3</u> taken at upper third of bluff approx. 25 feet off the left bank in 20-foot water depth, still along outside bend and in stiff current. Ponar sample came up empty, indicating a hard bottom (no sediments).
Need to determine suitability of this site due to strong currents.

<u>Site 7, Limerock Bluff at Bristol Boat Ramp:</u>
Upstream boundary: NM 81.4
Downstream boundary: NM 80.2 at Bristol Boat Ramp
Prelim Site Description: Limerock bluff beginning approximately 200 feet upstream of Bristol Landing. Hard clay bottom substrate, with sandstone interspersed in the upstream third of the site. Upstream end of bluff is plastic grey clay and sand.
Survey Cross-sections: Sections to be taken at 1000-foot intervals. Topo surveys to map clay ledge at base of bluff.
Ponar Sampling: No Ponar samples collected yet at this reach.

[See also attached Plates 1 – 7 from FDEP Permit No. 129424001-DF with notes.]

Enclosure 28

Memorandum for Record
Gulf Sturgeon Spawning Habitat Survey and Mapping
6-7 November 2003
20-21 November 2003
21-22 January 2004

CESAM-PD-EI 11 February 2004

MEMORANDUM FOR RECORD

SUBJECT: Gulf Sturgeon Spawning Habitat on the Apalachicola River – Continuation of Habitat Survey and Mapping, 06-07/20-21 November 2003, 21-22 January 2004

1. The Mobile District has agreed to consult with the USFWS on the effects of current water control operations on Gulf sturgeon spawning activities. USFWS has expressed concern that significant Gulf sturgeon spawning habitat located below Jim Woodruff Dam became exposed during extreme low flow stages experienced in the Spring of 2002. Gulf sturgeon utilize hard bottom habitat areas for spawning activities, in particular substrates with irregular surfaces that provide attachment for sturgeon eggs and shelter for non-free swimming larval stages. Preferred habitat areas are comprised of lime rock ledges, hard clay substrates, and gravel bars in areas of sufficient flow to wash the surface clean of sediments and debris, but with currents not so swift that the eggs or larvae would be washed off the site. Identification of the areal extent and relative depth of sturgeon spawning habitat available in the upper reaches of the Apalachicola River will assist in preparation of a biological assessment as part of Section 7 consultation under the Endangered Species Act. Collection of cross-sections at spawning habitat areas referenced to controlled elevation will provide information on relative depth of habitat areas. This data can be related to flow/stage rating information to determine extent of habitat inundated at various flow/stage regimes. This information can then be used in an assessment of water management operations during extended drought or low flow conditions to determine the effect on the Gulf sturgeon spawning activities.

2. On 06-07/20-21 November 2003 and 21-22 January 2004, members of the U.S. Army Corps of Engineers (USACE), Mobile District (CESAM), Panama City Site Office survey crew met with Joanne Brandt and Brian Zettle (CESAM-PD-EI) and Jerry Ziewitz of the U.S. Fish and Wildlife Service (USFWS), Panama City Field Office to conduct the follow-on data collection for the site mapping effort to map the upstream and downstream boundaries and areal extent of suitable spawning habitat for each of the sites identified during the October 2002 surveys. The Panama City Site Office survey crew collected cross-sections and prepared survey maps for the sites in the fall of 2002. The cross-section measurements extended across the entire river channel and up the bank within rock ledge areas; utilizing hydro and terrestrial survey techniques as necessary.

3. A Ponar sampler and probe were used to identify the bottom substrate (hard bottom, gravel bottom, or sand/silt bottom) at various points along each cross-section. A GPS coordinate (waypoint) was recorded for each substrate sample point. A probe was used to determine substrate composition in areas where water depth and clarity allowed for an accurate assessment of the bottom substrate. In all other areas the Ponar sampler was used to determine bottom substrate. A USFWS boat mounted with the Ponar sampling equipment was tethered to a USACE survey boat in order to ensure that the sample points occurred on the previously delineated cross-sections. The boats proceeded downstream from the Jim Woodruff Dam collecting substrate data along each cross-section. Sample points for each cross section began on the left bank and continued along the transect towards the right bank. The first sample point for each cross-section is generally located adjacent to the left bank. The results of the probe or

Ponar sample determined the location of the next sample point. However, sample points were generally located 50-100 feet apart. Extra sample points were taken in the

transitional areas between hard bottom and sand/silt bottom in order to more accurately define the areal extent of the suitable spawning habitat. The left and right bank of each cross-section was photographed, as well as, representative dredge samples for each type of substrate observed. Attached are the field notes describing the data collected at each waypoint.

4. The data collected during the surveys will be used to produce maps identifying the upstream and downstream boundaries and areal extent of suitable spawning habitat located in the Apalachicola River between Jim Woodruff Dam and Bristol, Florida. Furthermore, the data will be used to determine relative depths of habitat areas compared to flow/stage rating information to determine extent of habitat inundated at various flow/stage regimes. This information will ultimately be used in an assessment of water management operations during extended drought or low flow conditions to determine the effect on Gulf sturgeon spawning activities.

Attachments

BRIAN ZETTLE
Biologist
Inland Environment Team

CF:

Jangula/ CESAM-OP-GE
Vaughan/CESAM-EN-HW
Hathorn,CESAM-EN-H
Brandt/ CESAM-PD-EI
Findley/CESAM-PD-E
Peck/CESAM-PD-EC
Ziewitz/USFWS, Panama City Field Office

Field Notes

Potential Sturgeon Spawning Habitat Areas
06-07 November 2003

Site- Rock 106:

Survey Cross-Section 2+00:
Waypoint 1: Water depth = 6.1 ft. Left bank at shoreline; ponar came up empty with a few small pea gravel; no corbicula shells; Substrate consisted of hard bottom with a little pea gravel.
Waypoint 2: Water depth = 15.3 ft. Ponar came up empty; Substrate consisted of hard bottom with a little pea gravel.
Waypoint 3: Water depth = 17.0 ft. Substrate consisted of hard bottom (small chunk lime rock).
Waypoint 4: Water depth = 15.2 ft. Just off right bank locwall; Substrate consisted of Corbicula, gravel, silt bottom (too many fines to provide suitable habitat) [11:05 a.m.].
Waypoint 5: Water depth = 21.4 ft. Moved back 100-200 feet; ponar came up clean with no sand or silt. Substrate consisted of hard bottom.
Comments: Old gravel bar just off alignment of lock wall. Hard bottom extends from left bank at shoreline and waterward boundary located halfway between WP 4 and 5. Cross-section located just below buoy line. **Photos:** 1, 2, 3 (USFWS camera), 1 (USACE camera).

Survey Cross-Section 7+00:
Waypoint 6: Water depth = 3.0 ft. Substrate consisted of sand, gravel, and Corbicula (too much sand for suitable habitat – see photo of ponar sample).
Waypoint 7: Water depth = 9.5 ft. Ponar sample taken in mid-channel; came up clean; Substrate consisted of hard bottom [11:30 a.m.].
Waypoint 8: Water depth = 10.8 ft. Substrate consisted of gravel, cobble, Corbicula, and fines (not suitable bottom habitat).
Comments: Waypoint 6 was taken along sand/gravel bar overgrown with willows along left bank. The willows grew up during drought conditions and now act as a sediment trap. Two more samples were taken later in the day (3:05 p.m.) between the buried gravel/willow bar and the bank. However, the water was too shallow for the USACE survey boat so no waypoints were taken. The first sample was taken on the willow bar side of the powerhouse channel in 2.6 feet of water and the substrate consisted of gravel, Corbicula, and sand. The second sample was taken in water depth of 3.1 feet in the middle of the powerhouse channel, and consisted of gravel, cobble, and Corbicula. This gravel bar was exposed in the mid-1990s and provided suitable habitat for proposed mussel species (now listed). However, during the recent past drought years, the bar has become buried with sand and silt due to low flows, and has become vegetated with young willows. At this time the gravel bar does not provide suitable habitat for sturgeon spawning (May want to revisit after flood events to see if the bar becomes washed clean). **Photos:** 2, 3, 4 and 23.

Survey Cross-Section 12+00:
Waypoint 9: Water depth = 2.8 ft. Left bank, abutting submerged gravel/willow bar. Substrate consisted of silt, clay/sand mixture with Corbicula (not suitable habitat).
Waypoint 10: Water depth = 8.0 ft. Mid-channel sample. Substrate consisted of gravel (1/2" to 1"), Corbicula, and small amount of sand/silt (not suitable).
Waypoint 11: Water depth = 8.5 ft. Substrate consisted of gravel, Corbicula, and small amount of sand/silt.

Waypoint 12: Water depth = 15.0 ft. Substrate consisted of Corbicula, and small amount sand/silt [11:55 a.m.].
Comments: Gravel bar portions of cross-section contain too much sand, silt or corbicula. No suitable spawning substrate was located along this transect. **Photos:** 5 and 6.

Survey Cross-Section 20+00:
Waypoint 13: Water depth = 5.0 ft. Left bank, immediately adjacent to willows on sandy bank. Substrate consisted of Corbicula and silt (not suitable habitat) [12:36 p.m.].
Waypoint 14: Water depth = 7.3 ft. Substrate consisted of Corbicula, sand, silt, and pea gravel (not suitable habitat).
Waypoint 15: Water depth = 13.4 ft. Ponar taken in mid-channel. Substrate consisted of Corbicula and sand.
Waypoint 16: Water depth = 19.5 ft. Substrate consisted of Corbicula, sand, silt, and small amount of gravel.
Comments: Just upstream of Hwy 90 bridge. No suitable spawning substrate was located along this transect. **Photos:** 7 and 8.

Survey Cross-Section 37+00:
Waypoint 17: Water depth = 2.5 ft. Substrate consisted of Corbicula, gravel, and a few limestone chunks (2") (possibly suitable habitat).
Waypoint 18: Water depth = 11.3 ft. Ponar taken in mid-channel near red buoy, came up clean with small amount of limerock. Substrate consisted of hard bottom (limerock).
Waypoint 19: Water depth = 10.5 ft. Moved back to mid-point between WP 17 and 18 (left of red buoy). Ponar came up clean with limerock fragments and clean shell. Substrate consisted of hard bottom (limerock). Hard bottom boundary possibly located between WP 17 and 19. [1:04 p.m.]
Waypoint 20: Water depth = 9.5 ft. Ponar taken near green buoy. Substrate consisted of Corbicula, gravel, small amount of limerock and few fines (not suitable habitat). Hard bottom boundary between WP 19 and 20. [1:11 p.m.]
Comments: Suitable spawning substrate extends from midway between waypoints 17 and 19 to midway between waypoints 19 and 20. **Photos:** 9 and 10.

Survey Cross-Section 43+00:
Waypoint 21: Water depth = 6.0 ft. Large rock observed in vicinity of ponar sample. Sand in ponar sample. Substrate consisted of sand interspersed with rock.
Waypoint 22: Water depth = 15.0 ft. (COE sounding) Ponar taken in mid-channel, very swift current; sample contained a fragment of limerock. Substrate consisted of hard bottom (limerock). [1:28 p.m.]
Waypoint 23: Water depth = 8.2 ft. Substrate consisted of sand (predominately), gravel, and Corbicula (not suitable).
Waypoint 24: Water depth = 15.0 ft.. Moved back to sample between WP 22 and 23. Substrate consisted of gravel, sand, and Corbicula. Hard bottom boundary between WP 22 and 24.
Comments: Left bank at limerock outcropping. Swift current in mid-channel. Suitable hard bottom spawning substrate extends from the left bank to midway between waypoints 22 and 24. **Photos:** 11 and 12.

Survey Cross-Section 48+00:

Waypoint 25: Water depth = 4.5 ft. Limerock outcrop off left bank. Ponar came up clean. Substrate consisted of hard bottom (limerock).
Waypoint 26: Water depth = 17.1 ft. (COE sounding) Swift current. Ponar came up clean. Substrate consisted of hard bottom (limerock).
Waypoint 27: Water depth = 16.0 ft. Substrate consisted of gravel, Corbicula, and sand. [1:48 p.m.]
Comments: Suitable spawning substrate extends from rock outcrops on left bank to midway between waypoints 26 and 27. **Photos:** 13 and 14.

Survey Cross-Section 51+00:
Waypoint 28: Water depth = 3.5 ft. Boat on top of rock ledge on left bank. Ponar came up clean; algae on top of rock. Substrate consisted of hard bottom (limerock).
Waypoint 29: Water depth = 12.1 ft. Sample taken at edge of rock ledge. Swift current. Ponar came up clean, with large fragment of limerock. Substrate consisted of hard bottom (limerock).
Waypoint 30: Water depth = 16.5 ft. Swift current. Substrate consisted of hard bottom (limerock), and small amount of gravel and Corbicula.
Waypoint 31: Water depth = 10.5 ft. Swift current. Substrate consisted of fine gravel, sand, and Corbicula (not suitable habitat). [2:04 p.m.]
Comments: Suitable spawning substrate extends from left bank to midway between waypoints 30 and 31. Collected purple bankclimber mussel at waypoint 30 (note shell abraded due to gravel in swift current). **Photos:** 15, 16, and 17.

Survey Cross-Section 58+00:
Waypoint 32: Water depth = 5.0 ft. Ponar taken immediately at left bank shoreline. First sample collected large chunk of limerock and gravel; Second sample comprised of fines, sand, gravel and clay. Substrate consisted of rock overlain with gravel. Area disturbed due to barge offloading site for Dravo Sand and Gravel. [2:16 p.m.]
Waypoint 33 (1st Sample): Water depth = 14.3 ft. Ponar sample collected large chunk of limerock. Substrate consisted of rock interspersed with sand.
Waypoint 33 (2nd Sample): Water depth = 13.0 ft. Returned to waypoint to check bottom habitat. Substrate consisted of fines, pea gravel, sand, and silt (not suitable habitat). [2:26 p.m.]
Waypoint 34: Water depth = 21.5 ft. Sample taken in mid-channel. Substrate consisted of Corbicula and a small amount of gravel and silt (not suitable).
Comments: No suitable spawning substrate was located along this transect. **Photos:** 18, 19, and 20.

Survey Cross-Section 71+00:
Waypoint 35: Water depth = 3.5 ft. Substrate consisted of sand.
Waypoint 36: Water depth = 19.5 ft. Substrate consisted of Corbicula, sand, and gravel. [2:39 pm.]
Waypoint 37: Water depth = 27.0 ft. (COE sounding) Swift current. First Ponar sample in mid-channel came up clean with small fragment of limerock. Second sample came up clean. Substrate consisted of hard bottom (limerock).
Waypoint 38: Water depth = 24.0 ft. Silts observed in Ponar sample. Substrate consisted of pea gravel, sand, Corbicula, and fine silt.
Comments: Immediately downstream of Railroad trestle bridge (Note: underwater cable crossing). No Suitable spawning substrate was located along this transect?? Strip of hard bottom located in mid-channel deep water is not suitable due to swift currents??. **Photos:** 21 and 22.

Site- Rock 103.5:

Survey Cross-Section 8+00:

Waypoint 1: Water depth = 13.1 ft. Silty water. Substrate consisted of clay marl overlain by silt and a few Corbicula. [9:45 a.m.]

Waypoint 2: Water depth = 14.6 ft. Swifter current. Substrate consisted of sand, silt, gravel, and Corbicula.

Waypoint 3: Water depth = 8.5 ft. Substrate consisted of Corbicula, sand ,and gravel.

Waypoint 4: Water depth = 5.5 ft. Substrate consisted of silt, sand, pea gravel, and Corbicula. Too much silt to qualify the rock dikes as suitable spawning habitat?? What about when under water???

Comments: Immediately upstream of Jackson County Port Canal. Limerock dikes on left bank and sand on right bank (Rock removal disposal area, with rocks used to construct dikes). No Suitable spawning substrate was located along this transect. **Photos:** 27, 28, and 29.

Survey Cross-Section 13+00:

Waypoint 5: Water depth = 16.5 ft. Silty effluent form ponar sample. Substrate consisted of fine silt/sand, a few small clay marl chunks, and a few Corbicula. [10:00 a.m.]

Waypoint 6: Water depth = 15.5 ft. Ponar sample in mid-channel, silty effluent from ponar. Substrate consisted of Corbicula, silt/sand, and pea gravel.

Waypoint 7: Water depth = 9.3 ft. Less current, silty effluent from ponar sample. Substrate consisted of silt/sand, Corbicula, and pea gravel.

Comments: No Suitable spawning substrate was located along this transect. **Photos:** No photos were taken at this transect.

Survey Cross-Section 19+73:

Waypoint 8: Water depth = 6.5 ft. 1st Ponar sample came up clean with clear effluent. 2nd Ponar sample collected coble, limerock and Corbicula. 3rd Ponar sample collected large chunk of limerock. Substrate consisted of hard bottom (limerock), cobble, and Corbicula.

Waypoint 9: Water depth = 14.5 ft. Mid-channel, swifter current. 1st Ponar sample collected limerock chunk (Ponar stuck in open position); 2nd Ponar sample collected small amount of gravel and sand (sand overlying rock??); 3rd Ponar sample collected coarse sand, gravel and Corbicula. Substrate consisted of sand, gravel, and Corbicula overlying limerock???,.

Waypoint 10: Water depth = 6.5 ft. Sample taken in mid-channel; silty effluent from Ponar. Substrate consisted of gravel, sand/silt, limerock chunks, and Corbicula overlying limerock???.

Waypoint 11: Water depth = 4.8 ft. Sample taken at mouth of Canal. Slower current. Silty effluent from Ponar sample. Substrate consisted of fine sand and Corbicula.

Waypoint 12: Water depth = 5.5 ft. Sample taken just inside Canal. Silty effluent, detrital debris and Elliptio mussels found in sample. Substrate consisted of silt/sand and Corbicula.

Comments: May want to track down old Before and After drawings for the rock removal that occurred at this location in the 1980s to assist in delimiting boundaries of this site. Suitable spawning substrate extends from left bank to midway between waypoints 8 and 9.??? Elliptio mussels observed at waypoint 12. **Photos:** 30, 31, 32, and 33.

<u>Survey Cross-Section 33+00:</u>

Waypoint 13: Water depth = 9.5 ft. Silty effluent from Ponar. Substrate consisted of fine silty mud.

Waypoint 14: Water depth = 17.5 ft. Sample from mid-channel. Swift current, little silt in effluent from Ponar. Substrate consisted of coarse sand, pea gravel, and <u>Corbicula</u>.

Waypoint 15: Water depth = 8.8 ft. Slower current. Limerock chunk in Ponar sample. Substrate consisted of coarse sand, pea gravel, and <u>Corbicula overlying limerock???</u>.

Comments: Cross section under powerline. No Suitable spawning substrate was located along this transect.??? **Photos:** 34 and 35.

<u>Survey Cross-Section 38+00:</u>

Waypoint 16: Water depth = 7.3 ft. Left bank of clay marl. Substrate consisted of fine sand over soft clay.

Waypoint 17: Water depth = 9.4 ft. Sample from mid-channel. 1st Ponar sample collected limerock chunk and cobble; 2nd Ponar sample collected a limerock chunk; 3rd Ponar sample collected cobble, <u>Corbicula</u>, limerock chunk and coarse sands (no fines) (Photo 36 taken of Ponar sample). Substrate consisted of limerock overlain with cobble, gravel, and coarse sand. [11:15 a.m.]

Waypoint 18: Water depth = 13.8 ft. Sample taken in mid-channel. Swifter current. Silty effluent from Ponar sample. Substrate consisted of <u>Corbicula</u>, silt/sand, and a small amount of pea gravel.

Waypoint 19: Water depth = 10.5 ft. Ponar sample collected <u>Corbicula</u>, coarse sand and a limerock chunk. Substrate consisted of <u>Corbicula</u> and coarse sand overlying limerock???.

Comments: No Suitable spawning substrate was located along this transect.??? What about clean cobble, limerock shown in Photo 36??? **Photos:** 36, 37 and 38.

<u>Survey Cross-Section 42+00:</u>

Waypoint 20: Water depth = 3.3 ft. Clay marl on left bank, just upstream of rock training dikes on left bank. Moderate current. 1st Ponar sample clean with clear effluent; 2nd Ponar sample collected <u>Corbibula</u>, fine sand and limerock; and an <u>Elliptio</u> mussel. Substrate consisted of hard bottom (hard clay overlain with limerock and only a few fines). This would provide suitable habitat.

Waypoint 21: Water depth = 12.7 ft. Rock dikes just downstream on left bank. Sample taken in mid-channel, swifter current. 1st Ponar sample collected a large chunk of limerock; 2nd Ponar sample came up empty with clear effluent; 3rd Ponar sample came up empty with clear effluent. Substrate consisted of hard bottom (limerock). [11:40 a.m.]

Waypoint 22: Water depth = 9.8 ft. Mid channel, swift current. 1st Ponar sample collected limerock/marl chunk; 2nd Ponar sample collected coarse sands, <u>Corbicula</u>, and little gravel, with few fines in the effluent. Substrate consisted of limerock overlain with coarse sand, <u>Corbicula</u>, and a small amount of pea gravel.

Waypoint 23: Water depth = 6.0 ft. Right bank comprised of vegetated sandbar; and rock disposal area with rock used to form rock dikes. Rock cobble in ponar. Substrate consisted of hard bottom (hard clay overlain with limerock cobble due to rock disposal area).

Comments: Hard bottom extends across entire river channel, over the rock cobble on right bank, and up the left bank (moderate value habitat extends from a point halfway between

WP 21 and WP 22, to a point halfway between WP 22 and WP 23. Elliptio mussel observed at waypoint 20. **Photos:** 39, 40, 41 and 42.

Site 101.0:

Survey Cross-Section 4+00:

Waypoint 1: Water depth = 2.5 ft. Left bank of sandy clay. Silty effluent from Ponar. Substrate consisted of Corbicula and silt/sand.

Waypoint 2: Water depth = 7.5 ft. Sample taken in channel, moderate current. Clean effluent from Ponar. Substrate consisted of cobble, gravel, coarse sand, and a few Corbicula (too sandy to provide suitable habitat).

Waypoint 3: Water depth = 14.8 ft. Sample taken in mid-channel with swift current. Substrate consisted of coarse sand, pea gravel, Corbicula, and cobble limerock. [12:16 p.m.]

Waypoint 4: Water depth = 10.5 ft. Rock disposal area on sandbar on right bank. Silty effluent from Ponar. Substrate consisted of pea gravel, coarse sand, Corbicula, and a few fines (too sandy to provide suitable habitat).

Comments: No Suitable spawning substrate was located along this transect. **Photos:** 43 and 44.

Survey Cross-Section 10+00:

Waypoint 5: Water depth = 2.4 ft. Left bank sandy clay. Ponar sample collected small pieces of rock (hard clay). Substrate consisted of fine sand over hard clay.

Waypoint 6: Water depth = 2.5 ft. Slow current. Ponar sample came up empty. Substrate consisted of clean hard bottom (clay marl).

Waypoint 7: Water depth = 6.5 ft. Sample taken in mid-channel, with moderate to swift current. Ponar sample came up empty. Substrate consisted of hard bottom.

Waypoint 8: Water depth = 14.8 ft. Sample taken in mid-channel with swift current.1st Ponar sample collected small chunk of limerock, with clear effluent; 2nd Ponar sample collected a limerock chunk. Substrate consisted of hard bottom (limerock).

Waypoint 9: Water depth = 12.7 ft. Sample taken in mid-channel with swift current. Ponar collected coarse sand, Corbicula, and pea gravel, with clear effluent. Substrate consisted of coarse sand, Corbicula, and pea gravel.

Waypoint 10: Water depth = 7.0 ft. Sandy right bank. Substrate consisted of coarse sand, Corbicula, and pea gravel.

Comments: Suitable spawning substrate extends from midway between waypoints 5 and 6 to midway between waypoints 8 and 9. **Photos:** 45 and 46.

Survey Cross-Section 14+00:

Waypoint 11: Water depth = 2.5 ft. Left bank of soft sandy clay, located just downstream of slough. Substrate consisted of soft sand and clay.

Waypoint 12: Water depth = 3.0 ft. Silty effluent from Ponar sample. Substrate consisted of silt/sand, Corbicula, and pea gravel (sandy bottom over clay –too sandy for suitable habitat).

Waypoint 13: Water depth = 8.0 ft. Sample taken from mid-channel with swift current. Substrate consisted of silt/sand, pea gravel, and Corbicula.

Waypoint 14: Water depth = 4.9 ft. Clay cobble on bank, comprised of vegetated sandbar. Substrate consisted of cobble, coarse gravel, <u>Corbicula,</u> and a small amount of fine sand. Possible suitable habitat

Comments: Immediately downstream of slough. Potentially suitable spawning substrate (moderate value habitat) extends from midway between waypoints 13 and 14 to the right bank. Right bank consisted of vegetated sand bar overlain with clay and cobble. **Photos:** 47 and 48.

<u>Site 100.3:</u>

<u>Survey Cross-Section 3+00:</u>

Waypoint 1: Water depth = 2.0 ft. Left bank sandy. Probed bottom, no Ponar sample taken. Substrate consisted of hard clay overlain with silt/sand.

Waypoint 2: Water depth = 3.5 ft. Slow to moderate current. A few fines observed in effluent from Ponar sample. Substrate consisted of silt/sand and <u>Corbicula</u>.

Waypoint 3: Water depth = 7.8 ft. Ponar sample taken in mid channel. Swift current. Silty effluent observed from Ponar sample. Substrate consisted of coarse sand, pea gravel, <u>Corbicula</u>, and silt.

Waypoint 4: Water depth = 13.4 ft. Ponar sample taken from mid-channel. Moderate to swift current. 1st Ponar sample came up empty with clear effluent; 2nd sample collected a small chunk of limerock. Substrate consisted of hard bottom (limerock).

Waypoint 5: Water depth = 13.7 ft. Ponar sample taken near green can on right bank (deeper channel). Swift current. Ponar sample came up empty/clean. Substrate consisted of hard bottom (limerock).

Waypoint 6: Water depth = 1.0 ft. Probed substrate at limerock disposal area located on right bank. Substrate consisted of limerock overlain with sand.

Comments: Immediately upstream of I-10 bridge. Suitable spawning substrate extends from midway between waypoints 3 and 4 to midway between waypoints 5 and 6. **Photos:** 49 and 50.

<u>Survey Cross-Section 8+00:</u>

Waypoint 7: Water depth = 3.0 ft. Left bank soft sand. Probed bottom, no Ponar sample taken. Substrate consisted of soft sand.

Waypoint 8: Water depth = 7.5 ft. Ponar sample taken in mid-channel. Moderate to swift current. Substrate consisted of coarse sand, pea gravel, and <u>Corbicula</u>.

Waypoint 9: Water depth = 14.8 ft. Moderate to swift channel. 1st Ponar sample collected limerock chunk, with Ponar stuck open. 2nd Ponar sample collected small piece of limerock. Substrate consisted of hard bottom (limerock).

Comments: Suitable spawning substrate extends from midway between waypoints 8 and 9 to the rock disposal area on the right bank. **Photos:** 51 and 52.

<u>Survey Cross-Section 11+00:</u>

Waypoint 10: Water depth = 4.0 ft. Sandy left bank, located at DA 146B upstream boundary marker. Probed bottom, no Ponar sample taken. Substrate consisted of soft silt/sand.

Waypoint 11: Water depth = 11.0 ft. Ponar sample taken in mid-channel. Swift current. Substrate consisted of silt/coarse sand, pea gravel, and <u>Corbicula</u>.

Waypoint 12: Water depth = 11.1 ft. Ponar came up empty/clean. Substrate consisted of hard bottom (limerock).

Waypoint 13: Water depth = 14.0 ft. Moved back to point between WP 11 and WP 12. Ponar sample came up ajar with rock fragment, and some coarse sand, pea gravel and Corbicula. Substrate consisted of coarse sand, pea gravel, and Corbicula overlying limerock???. [2:10 p.m.]

Comments: Limerock ledge terrace just above I-10, with limerock disposal area located upstream on the right bank. Suitable spawning substrate extends from midway between waypoints 13 and 12 to the rock ledge on the right bank. **Photos:** 53 and 54.

Potential Sturgeon Spawning Habitat Areas
20-21 November 2003

Site 99.5:

Survey Cross-Section 0+00:

Waypoint 1: Water depth = 7.3 ft. Left bank is soft sand and clay, vegetated bank. Silty effluent from Ponar sample. Substrate consisted of clay, silt/sand, and Corbicula. [9:35 a.m.]

Waypoint 2: Water depth = 10.0 ft. Left bank on outside bend. Ponar sample taken near red buoy. Swifter current. Two Ponar samples taken and both came up empty/clean effluent from Ponar. Substrate consisted of hard bottom.

Waypoint 3: Water depth = 9.8 ft. Samples taken in mid-channel just downstream of most downstream training dike on right bank?? Two Ponar samples taken and both came up empty, clear effluent with very little sand. Substrate consisted of hard bottom.

Waypoint 4: Water depth = 15.0 ft. Swift current observed just upstream of downstream training dike. A little silt in effluent from Ponar. Substrate consisted of coarse sand, pea gravel, and Corbicula.

Comments: Suitable spawning substrate extends from midway between waypoints 1 and 2 to midway between waypoints 3 and 4. (Decided not to take sample between the last 2 downstream rock training dikes.) **Photos:** 1 and 2.

Survey Cross-Section 5+00:

Waypoint 5: Water depth = 3.5 ft. Mouth of Aspalaga Creek, just upstream of boat ramp. Vegetated clayey sand bank. Probed bottom, no Ponar sample taken. Substrate consisted of soft clay and silt. [10:00 a.m.]

Waypoint 6: Water depth = 14.9 ft. Swift current. 1st Ponar sample collected very small amount of pea gravel and Corbicula, with clear effluent; 2nd Ponar sample collected small amount of coarse sand and rock fragment. Substrate consisted of hard bottom overlain with very small amount of pea gravel and coarse sand.

Waypoint 7: Water depth = 14.0 ft. Ponar sample taken in mid-channel. 1st Ponar sample collected sandstone rock fragment with Ponar ajar, clear effluent; 2nd Ponar sample came up empty/clean. Substrate consisted of hard bottom.

Waypoint 8: Water depth = 14.0 ft. Ponar sample came up with clear effluent and small fragment of hard clay rock. Substrate consisted of hard bottom.

Waypoint 9: Water depth = 5.5 ft. Eddy area downstream of dike field and disposal area, with slower current. Very silty effluent from Ponar. Substrate consisted of silt/sand and Corbicula.

Comments: Mouth of Aspalaga Creek, immediately upstream of boat ramp. Suitable spawning substrate extends from midway between waypoints 5 and 6 to midway between waypoints 8 and 9. **Photos:** 3, 4, and 5.

Survey Cross-Section 9+99:

Waypoint 10: Water depth = 8.6 ft. Limerock bluff and rock shelf, with lots of submerged limerock boulders along left bank at shoreline. Rock bluff all the way to top of bank. No Ponar sample taken. Substrate consisted of hard bottom (limerock).

Waypoint 11: Water depth = 12.7 ft. Ponar sample came up empty with clear effluent. Substrate consisted of hard bottom.

Waypoint 12: Water depth = 14.0 ft. Ponar sample taken in mid-channel. Ponar came up empty, with a little coarse sand on top of Ponar, and with clear effluent. Substrate consisted of hard bottom. [10:40 a.m.]

Waypoint 13: Water depth = 14.0 ft. Ponar collected coarse sand with little pea gravel, and clear effluent. Substrate consisted of coarse sand and a small amount of pea gravel.

Comments: Left bank consists of limerock bluff and right bank includes a rock disposal area. Suitable spawning substrate extends from the left bank to midway between waypoints 12 and 13. **Photos:** 6 and 7.

Survey Cross-Section 15+00:

Waypoint 14: Water depth = 5.1 ft. Limerock shelf and limerock bluff on left bank. Ponar collected clear sample with very little coarse sand and rock fragments. Substrate consisted of hard bottom (limerock).

Waypoint 15: Water depth = 12.5 ft. Ponar sample taken in mid-channel, with very swift current. Ponar sample had a few crumbs of limerock with clear effluent. Substrate consisted of hard bottom (limerock).

Waypoint 16: Water depth = 12.3 ft. Ponar sample from mid-channel; clean with limerock chips. Substrate consisted of hard bottom (limerock).

Waypoint 17: Water depth = 12.0 ft. 1st Ponar sample clean with clear effluent; 2nd Ponar sample clear effluent with small amount of sand. Substrate consisted of hard bottom. (10:55 a.m.)

Waypoint 18: Water depth = 1.0 ft. No Ponar sample taken. Clean washed rock cobble disposal site; good rock habitat extends to the right bank at an elevation approximately 1 foot above current river stage water level; provides good bottom habitat with shelter from swift current. Substrate consisted of hard bottom (rock cobble).

Comments: Left bank consists of limerock shelf and bluff and right bank includes a rock disposal site. Suitable spawning substrate extends across entire transect. Rock cobble on right bank extends another 1.0 ft above current river stage. **Photos:** 8, 9, and 10.

Survey Cross-Section 20+00:

Waypoint 19: Water depth = 5.5 ft. Limerock shelf and limerock bluff on left bank. Ponar sample taken near red buoy but outside channel. Clean Ponar sample with limerock chips. Substrate consisted of hard bottom (limerock).

Waypoint 20: Water depth = 14.0 ft. Ponar sample taken in mid-channel with swift current; sample collected rock fragments/hard clay chunks (photo taken of Ponar sample). Substrate consisted of hard bottom (clayrock).

Waypoint 21: Water depth = 9.8 ft. Downstream portion of cobble rock disposal area on right bank. No Ponar sample taken. Same comments as for Waypoint 18. Substrate consisted of hard bottom (rock cobble). (11:25 a.m.)

Comments: Left bank consists of limerock shelf and bluff and right bank includes a rock disposal site. Suitable spawning substrate extends across entire transect. **Photos:** 11, 12, 13, and 14.

<u>Survey Cross-Section 25+00:</u>

Waypoint 22: Water depth = 5.0 ft. Limerock ledge and limerock bluff on left bank. Limerock ledge with boulders. Ponar collected clean sample with limerock fragments. Substrate consisted of hard bottom (limerock).

Waypoint 23: Water depth = 14.2 ft. Mid-channel with swift current. Clear effluent from Ponar, small amount of gravel, very little sand. Substrate consisted of hard bottom (limerock) overlain with a thin layer of gravel and a small amount of sand.

Waypoint 24: Water depth = 3.5 ft. Slow current area just downstream of rock disposal area on right bank. Silty sand effluent from Ponar sample. Substrate consisted of rock cobble overlain with silt/sand (not suitable habitat due to silty sands).

Comments: Left bank consists of limerock shelf and bluff and right bank consists of sand and clay with vegetation. Suitable spawning substrate extends from left bank to midway between waypoints 23 and 24. **Photos:** 15 and 16.

<u>Survey Cross-Section 30+00:</u>

Waypoint 25: Water depth = 4.9 ft. Slow current area – almost still current. Limerock ledge with boulders, interspersed with gravel. Spring observed seeping from left bank. No Ponar sample taken. Substrate consisted of hard bottom (limerock) boulders interspersed with gravel, <u>Corbicula</u>, and fine sand. Fines are probably washed away during spring flows, and the slower current is good for sturgeon spawning.

Waypoint 26: Water depth = 13.2 ft. Mid-channel. Ponar sample was clean with small rock fragments. Current was not as swift. Substrate consisted of hard bottom (limerock).

Waypoint 27: Water depth = 13.5 ft. Mid-channel, swift current. Ponar collected coarse sand an pea gravel. Substrate consisted of coarse sand and pea gravel.

Waypoint 28: Water depth = 8.2 ft. Right bank vegetated with sand and clay substrate. Less current than in mid-channel. Ponar sample collected lots of coarse sand, very little pea gravel, with clear effluent. Substrate consisted of coarse sand and small amount of pea gravel.

Comments: Left bank consists of limerock shelf and bluff and right bank consists of sand and clay with vegetation. Suitable spawning substrate extends from left bank to midway between waypoints 26 and 27. Fine sand observed at waypoint 25 probably is washed away during spring flows providing suitable habitat. **Photos:** 17 and 18.

<u>Survey Cross-Section 35+00:</u>

Waypoint 29: Water depth = 6.5 ft. Left bank comprised of hard sand/clay bank. Ponar sample collected silty sand with clay fragments; very silty in sample with some silt in effluent. Substrate consisted of silt/sand with clay fragments.

Waypoint 30: Water depth = 7.8 ft. 1st Ponar sample was ajoar due to cobble rock fragment, with small amount of sand; 2nd Ponar sample collected cobble rock and coarse gravel with very little fines. (Photo taken of Ponar sample). Substrate consisted of rock cobble and coarse gravel, which would provide good hard bottom habitat.

Waypoint 31: Water depth = 14.0 ft. Moved to point between Waypoint 29 and Waypoint 30 to better define boundary. Ponar collected hard clay rock fragment with clean effluent. Substrate consisted of hard bottom (clayrock). (12:10 p.m.)

Waypoint 32: Water depth = 8.7 ft. Right bank is vegetated with sand/clay substrate. Slower current. Small amount of silt in Ponar effluent.Substrate consisted of fine silt/sand, pea gravel, and Corbicula.

Comments: Left bank consists of sand and clay. Right bank consists of sand and clay with vegetation. Suitable spawning substrate extends from midway between waypoints 29 and 31 to midway between waypoints 30 and 32. Root wads along left bank provide additional habitat. **Photos:** 19, 20, 21, and 22.

Survey Cross-Section 40+00:

Waypoint 33: Water depth = 6.5 ft. Substrate consisted of hard clay/sand.

Waypoint 34: Water depth = 12.5 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 35: Water depth = 12.5 ft. Substrate consisted of coarse sand.

Waypoint 36: Water depth = 6.0 ft. Substrate consisted of coarse sand and pea gravel.

Comments: Left bank consists of hard clay shelf and soft sand bluff and right bank consists of sand and clay with vegetation. Suitable spawning substrate extends from (define area). **Photos:** 23.

Survey Cross-Section 45+00:

Waypoint 37: Water depth = 6.5 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 38: Water depth = 14.2 ft. Substrate consisted of hard bottom (limerock cobble and boulders).

Waypoint 39: Water depth = 12.0 ft. Substrate consisted of coarse sand.

Waypoint 40: Water depth = 4.5 ft. Substrate consisted of coarse sand, pea gravel, and small amount of silt.

Comments: Left bank consists of hard clay shelf and soft sand bluff and right bank consists of sand and clay with vegetation. Suitable spawning substrate extends from left bank to midway between waypoints 38 and 39. **Photos:** 24, 25, and 26.

Survey Cross-Section 49+00:

Waypoint 41: Water depth = 6.0 ft. Substrate consisted of silt and clay cobble.

Waypoint 42: Water depth = 10.0 ft. Substrate consisted of hard bottom (rock cobble).

Waypoint 43: Water depth = 13.0 ft. Substrate consisted of coarse sand and pea gravel.

Waypoint 44: Water depth = 2.5 ft. Substrate consisted of silt/sand covering hard bottom.

Comments: Left bank consists of sand/clay terraced ledge and right bank consists of sand/clay with rock cobble. Right bank covered with too much silt to be suitable. Suitable spawning substrate extends from midway between waypoints 41 and 42 to midway between waypoints 42 and 43. **Photos:** 27 and 28.

Survey Cross-Section 54+00:

Waypoint 45: Water depth = 10.0 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 46: Water depth = 12.0 ft. Substrate consisted of hard bottom (limerock/clayrock).

Waypoint 47: Water depth = 12.0 ft. Substrate consisted of hard bottom (limerock) and a small amount of coarse gravel.

Waypoint 48: Water depth = 7.5 ft. Substrate consisted of coarse sand and Corbicula.

Waypoint 49: Water depth = 7.5 ft. Substrate consisted of coarse sand.

Comments: Left bank consists of sand/clay and right bank consists of disposal area 141A (sand and rock cobble). Suitable spawning substrate extends from left bank to midway between waypoints 47 and 48. **Photos:** 29 and 30.

<u>Survey Cross-Section 63+00:</u>

Waypoint 50: Water depth = 4.9 ft. Substrate consisted of clay cobble interspersed with fine sand and gravel.

Waypoint 51: Water depth = 13.5 ft. Substrate consisted of fine sand, pea gravel, and <u>Corbicula</u>.

Waypoint 52: Water depth = 7.6 ft. Substrate consisted of coarse sand and <u>Corbicula</u>.

Comments: Left bank consists of clay cobble overlain with fine sand and right bank consists of disposal area 141A (sand and rock cobble). Suitable spawning substrate does not exist on this transect. **Photos:** 31 and 32.

<u>Survey Cross-Section 73+00:</u>

Waypoint 53: Water depth = 4.7 ft. Substrate consisted of fine sand/silt and clay.

Waypoint 54: Water depth = 10.0 ft. Substrate consisted of fine sand, pea gravel, and <u>Corbicula</u>.

Waypoint 55: Water depth = 5.1 ft. Substrate consisted of coarse sand.

Comments: Left bank consists of sand/clay and right bank consists of disposal area 141A (sand revegetated with willow, sycamore, and river birch). Suitable spawning substrate does not exist on this transect. **Photos:** 33 and 34.

<u>Survey Cross-Section 83+00:</u>

Waypoint 56: Water depth = 6.5 ft. Substrate consisted of silt and fine sand.

Waypoint 57: Water depth = 10.8 ft. Substrate consisted of coarse and fine sand.

Waypoint 58: Water depth = 7.8 ft. Substrate consisted of coarse sand.

Comments: Left bank consists of sand and transect is located immediately upstream of rock dikes. Right bank consists of sand. Suitable spawning substrate does not exist on this transect. **Photos:** 35, 36, and 37.

<u>Site 95.2:</u>

<u>Survey Cross-Section 10+00:</u>

Waypoint 1: Water depth = 1.5 ft. Substrate consisted of hard bottom (limerock).

Waypoint 2: Water depth = 9.0 ft. Substrate consisted of hard bottom (limerock).

Waypoint 3: Water depth = 9.8 ft. Substrate consisted of hard bottom (limerock).

Waypoint 4: Water depth = 9.5 ft. Substrate consisted of hard bottom overlain with thin layer of coarse sand.

Comments: Immediately downstream of disposal area 138A and slough that was recently opened. Left bank consists of limestone edge and right bank consists of terraced sand with vegetation and root wads. Suitable spawning substrate extends from left bank to midway between waypoints 3 and 4. **Photos:** 38 and 39.

<u>Survey Cross-Section 14+00:</u>

Waypoint 5: Water depth = 3.5 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 6: Water depth = 10.0 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 7: Water depth = 14.8 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 8: Water depth = 9.0 ft. Substrate consisted of coarse sand.

Comments: Left bank consists of hard clayrock overlain by sand/clay bluff and right bank consists of terraced sand. Suitable spawning substrate extends from left bank to midway between waypoints 7 and 8. **Photos:** 40 and 41.

Survey Cross-Section 18+00:
Waypoint 9: Water depth = 4.5 ft. Substrate consisted of hard bottom (limerock/clayrock).
Waypoint 10: Water depth = 15.0 ft. Substrate consisted of hard bottom (limerock/clayrock).
Waypoint 11: Water depth = 13.5 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of limerock over clayrock and right bank consists of terraced sand. Suitable spawning substrate extends from left bank to midway between waypoints 10 and 11. **Photos:** 42, 43, 44, and 45.

Site 94.0:

Survey Cross-Section 0+00:
Waypoint 1: Water depth = 5.5 ft. Substrate consisted of silt/sand.
Waypoint 2: Water depth = 15.4 ft. Substrate consisted of coarse and fine sands.
Waypoint 3: Water depth = 10.7 ft. Substrate consisted of silt/sand and Corbicula.
Comments: Immediately downstream of disposal area 138A and slough that was recently opened. Left bank consists of terraced sand bluff and right bank consists of sand and limerock cobble at disposal area 136. Suitable spawning substrate does not exist on this transect. **Photos:** 46 and 47.

Survey Cross-Section 4+70:
Waypoint 4: Water depth = 3.9 ft. Substrate consisted of hard silt/sand.
Waypoint 5: Water depth = 13.0 ft. Substrate consisted of coarse sand.
Waypoint 6: Water depth = 7.7 ft. Substrate consisted of hard bottom (limerock).
Waypoint 7: Water depth = 41.0 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of terraced sand bluff and right bank consists of gravel size limerock (possible old disposal area). Suitable spawning substrate extends from right bank to midway between waypoints 6 and 7. **Photos:** 48 and 49.

Survey Cross-Section 10+00:
Waypoint 8: Water depth = 3.5 ft. Substrate consisted of coarse sand.
Waypoint 9: Water depth = 21.5 ft. Substrate consisted of coarse sand and pea gravel.
Waypoint 10: Water depth = 28.0 ft. Substrate consisted of hard bottom (limerock).
Waypoint 11: Water depth = 27.5 ft. Substrate consisted of hard bottom (limerock).
Comments: Left bank consists of sand and right bank consists of clay/sand with tree stumps. Suitable spawning substrate extends from right bank to midway between waypoints 11 and 9. **Photos:** 50 and 51.

Survey Cross-Section 15+00:
Waypoint 12: Water depth = 3.0 ft. Substrate consisted of coarse sand and a small amount of limerock cobble.
Waypoint 13: Water depth = 13.3 ft. Substrate consisted of hard bottom (limerock).
Waypoint 14: Water depth = 8.0 ft. Substrate consisted of coarse sand.
Waypoint 15: Water depth = 14.8 ft. Substrate consisted of hard bottom (limerock).
Comments: Left bank consists of sand and right bank consists of clay and cypress stumps. Suitable spawning substrate extends from right bank to midway between waypoints 13 and 14. **Photos:** 52, 53, and 54.

Survey Cross-Section 20+00:

Waypoint 16: Water depth = 3.0 ft. Substrate consisted of coarse sand with scattered limerock cobble.
Waypoint 17: Water depth = 7.2 ft. Substrate consisted of coarse sand.
Waypoint 18: Water depth = 8.5 ft. Substrate consisted of coarse sand.
Waypoint 19: Water depth = 10.0 ft. Substrate consisted of hard bottom overlain with thin layer of coarse gravel/sand and Corbicula.
Waypoint 20: Water depth = 11.0 ft. Substrate consisted of hard bottom.
Comments: Left bank consists of sand and right bank consists of eroding sand/clay bank. Suitable spawning substrate extends from right bank to midway between waypoints 18 and 19. **Photos:** 55 and 56.

Survey Cross-Section 24+89:
Waypoint 21: Water depth = 3.0 ft. Substrate consisted of sand with a small amount of gravel.
Waypoint 22: Water depth = 5.0 ft. Substrate consisted of coarse sand.
Waypoint 23: Water depth = 10.0 ft. Substrate consisted of coarse sand with a small amount of gravel.
Waypoint 24: Water depth = 11.0 ft. Substrate consisted of hard bottom.
Comments: Left bank consists of sand and right bank consists of terraced sand/clay. Suitable spawning substrate extends from right bank to midway between waypoints 23 and 24. **Photos:** 57 and 58.

Survey Cross-Section 29+00:
Waypoint 25: Water depth = 2.5 ft. Substrate consisted of sand/silt with a small amount of gravel.
Waypoint 26: Water depth = 9.2 ft. Substrate consisted of coarse sand.
Waypoint 27: Water depth = 9.8 ft. Substrate consisted of hard bottom (limerock).
Waypoint 28: Water depth = 9.5 ft. Substrate consisted of gravel with a small amount of coarse sand.
Comments: Left bank consists of sand and right bank consists of eroded sand/clay. Suitable spawning substrate extends from right bank to midway between waypoints 27 and 28. **Photos:** 59 and 60.

Survey Cross-Section 34+00:
Waypoint 29: Water depth = 2.5 ft. Substrate consisted of coarse sand, silt, and gravel.
Waypoint 30: Water depth = 6.5 ft. Substrate consisted of coarse sand, silt, and gravel.
Waypoint 31: Water depth = 16.0 ft. Substrate consisted of hard bottom.
Waypoint 32: Water depth = 8.7 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of sand and right bank consists of eroded clay bank. Suitable spawning substrate extends from right bank to midway between waypoints 31 and 32. **Photos:** 61 and 62.

Survey Cross-Section 38+41:
Waypoint 33: Water depth = 4.7 ft. Substrate consisted of coarse/fine sand and a small amount of pea gravel.
Waypoint 34: Water depth = 9.9 ft. Substrate consisted of coarse sand.
Waypoint 35: Water depth = 15.0 ft. Substrate consisted of gravel, small amount of fines, and Corbicula.
Comments: Left bank consists of sand and right bank consists of eroded sand/clay bank. Gravel area may represent suitable spawning substrate. **Photos:** 63 and 64.

Survey Cross-Section 43+00:

Waypoint 36: Water depth = 6.1 ft. Substrate consisted of coarse sand.

Waypoint 37: Water depth = 9.7 ft. Substrate consisted of coarse sand, pea gravel, and Corbicula.

Waypoint 38: Water depth = 13.9 ft. Substrate consisted of coarse gravel, pea gravel, Corbicula, and a small amount of fines.

Waypoint 39: Water depth = 12.0 ft. Substrate consisted of silt/sand.

Comments: Immediately downstream of rock disposal area. Left bank consists of rock disposal area and right bank consists of eroded clay bank. Suitable spawning substrate does not exist on this transect. **Photos:** 65, 66, and 67.

Survey Cross-Section 48+00:

Waypoint 40: Water depth = 5.0 ft. Substrate consisted of coarse sand.

Waypoint 41: Water depth = 10.5 ft. Substrate consisted of coarse sand.

Waypoint 42: Water depth = 18.7 ft. Substrate consisted of pea gravel, coarse gravel, sand, and Corbicula.

Comments: Located at upstream end of rock disposal area. Left bank consists of sand/clay sloped bank with vegetation and right bank consists of eroded clay bank with cypress stumps and snags. Suitable spawning substrate does not exist on this transect. **Photos:** 68 and 69.

Survey Cross-Section 53+00:

Waypoint 43: Water depth = 8.5 ft. Substrate consisted of fine sand.

Waypoint 44: Water depth = 14.5 ft. Substrate consisted of hard bottom (clayrock).

Waypoint 45: Water depth = 14.0 ft. Substrate consisted of hard bottom (clayrock).

Comments: Located at upstream end of rock disposal area. Left bank consists of sand and right bank consists of eroded clay bank. Suitable spawning substrate extends from right bank to midway between waypoints 43 and 44. **Photos:** 70 and 71.

Survey Cross-Section 58+00:

Waypoint 46: Water depth = 6.0 ft. Substrate consisted of silt/sand.

Waypoint 47: Water depth = 14.3 ft. Substrate consisted of coarse sand.

Waypoint 48: Water depth = 16.5 ft. Substrate consisted of hard bottom (coarse gravel and clayrock).

Waypoint 49: Water depth = 13.4 ft. Substrate consisted of coarse sand and pea gravel.

Comments: Left bank consists of sand and right bank consists of eroded clay bank. Suitable spawning substrate extends from right bank to midway between waypoints 48 and 49. **Photos:** 72 and 73.

Site 92.7:

Survey Cross-Section 0+00:

Waypoint 1: Water depth = 7.0 ft. Substrate consisted of silt and mud.

Waypoint 2: Water depth = 19.0 ft. Substrate consisted of coarse sand.

Waypoint 3: Water depth = 22.0 ft. Substrate consisted of coarse sand and pea gravel.

Comments: Located at mouth of slough. Left bank consists of sand and right bank consists of eroded clay bank. Suitable spawning substrate does not exist on this transect. **Photos:** 74, 75, and 76.

Survey Cross-Section 4+50:
Waypoint 4: Water depth = 22.0 ft. Substrate consisted of mud/silt over rock.
Waypoint 5: Water depth = 36.0 ft. Substrate consisted of coarse and fine sand.
Waypoint 6: Water depth = 25.0 ft. Substrate consisted of coarse sand.
Waypoint 7: Water depth = 6.5 ft. Substrate consisted of coarse sand and pea gravel.
Comments: Left bank consists of limerock and right bank consists of terraced sand overlain with sand/clay. Suitable spawning substrate is limited to the left bank area. **Photos:** 77, 78, 79, and 80.

Survey Cross-Section 10+00:
Waypoint 8: Water depth = 15.0 ft. Substrate consisted of hard bottom (limerock).
Waypoint 9: Water depth = 34.0 ft. Substrate consisted of coarse sand.
Waypoint 10: Water depth = 28.2 ft. Substrate consisted of fine sand.
Comments: Immediately upstream of slough opening. Left bank consists of limerock ledge with boulders and right bank consists of terraced sand. Suitable spawning substrate extends from left bank to midway between waypoints 8 and 9. **Photos:** 81, 82, 83, and 84.

Site 92.7 (continued):

Survey Cross-Section 15+00:
Waypoint 11: Water depth = 7.0 ft. Substrate consisted of hard bottom (limerock).
Waypoint 12: Water depth = 22.0 ft. Substrate consisted of gravel, sand, and silt.
Waypoint 13: Water depth = 18.0 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of limerock ledge and right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 11 and 12. **Photos:** 1, 2, and 3.

Survey Cross-Section 20+00:
Waypoint 14: Water depth = 4.5 ft. Substrate consisted of sand.
Waypoint 15: Water depth = 13.0 ft. Substrate consisted of sand with a small amount of Corbicula and gravel.
Waypoint 16: Water depth = 16.0 ft. Substrate consisted of sand with a small amount of gravel.
Comments: Rock dikes on left bank. Left bank consists of sand and right bank consists of sand. Suitable spawning substrate does not exist on this transect. **Photos:** 4, 5, 6, and 7.

Survey Cross-Section 21+36:
Waypoint 17: Water depth = 9.8 ft. Substrate consisted of sand over limerock/clay (soft).
Waypoint 18: Water depth = 12.5 ft. Substrate consisted of coarse sand.
Waypoint 19: Water depth = 18.5 ft. Substrate consisted of coarse sand.
Comments: Located outside of dike field. Left bank consists of sand and right bank consists of sand over limerock/clay (soft). Suitable spawning substrate does not exist on this transect. **Photos:** 8, 9, and 10.

Site 84.5:

Survey Cross-Section 0+00:
Waypoint 1: Water depth = 5.0 ft. Substrate consisted of hard silt/clay.
Waypoint 2: Water depth = 18.8 ft. Substrate consisted of coarse and fine sand.
Waypoint 3: Water depth = 10.8 ft. Substrate consisted of coarse sand and a small amount of gravel.
Comments: Left bank consists of sand/clay and right bank consists of sand. Suitable spawning substrate does not exist on this transect. **Photos:** 11 and 12.

Survey Cross-Section 10+00:
Waypoint 4: Water depth = 11.0 ft. Substrate consisted of hard bottom (limerock/alum clay), boulders, with sand in interstices.
Waypoint 5: Water depth = 22.0 ft. Substrate consisted of hard bottom (limerock/alum clay), boulders, with sand in iterstices.
Waypoint 6: Water depth = 24.0 ft. Substrate consisted of pea gravel and coarse sand.
Waypoint 7: Water depth = 15.0 ft. Substrate consisted of coarse sand.
Comments: Alum bluff boundary begins approximately half way between waypoints 3 and 4. Left bank consists of limerock boulders below sheer rock bluff and right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 5 and 6. **Photos:** 13, 14, and 15.

Survey Cross-Section 20+00:
Waypoint 8: Water depth = 11.0 ft. Substrate consisted of silt/sand.
Waypoint 9: Water depth = 12.8 ft. Substrate consisted of coarse sand and pea gravel.
Waypoint 10: Water depth = 14.7 ft. Substrate consisted of coarse sand.
Comments: Recent sand slide off of Alum bluff. Left bank consists of limerock boulders below sheer rock bluff and right bank consists of sand/clay. Suitable spawning substrate is limited to the rock areas along the left bank??. **Photos:** 16, 17, and 18.

Survey Cross-Section 30+00:
Waypoint 11: Water depth = 19.5 ft. Substrate consisted of hard bottom (sand/clayrock).
Waypoint 12: Water depth = 25.0 ft. Substrate consisted of coarse sand.
Waypoint 13: Water depth = 9.0 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of hard sand/clayrock ledge and right bank consists of sand/clay. Suitable spawning substrate extends from left bank to midway between waypoints 11 and 12. **Photos:** 19, 20, 21, 22, and 23.

Survey Cross-Section 41+00:
Waypoint 14: Water depth = 5.4 ft. Substrate consisted of fine sand.

Waypoint 15: Water depth = 21.5 ft. Substrate consisted of fine and coarse sand.
Waypoint 16: Water depth = 16.0 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of sand and right bank consists of sand. Suitable spawning substrate does not exist on this transect. **Photos:** 24, 25, 26, and 27.

Survey Cross-Section 43+86:
Waypoint 17: Water depth = 6.5 ft. Substrate consisted of silt and sand/clay.
Waypoint 18: Water depth = 17.7 ft. Substrate consisted of fine and coarse sand.
Waypoint 19: Water depth = 16.4 ft. Substrate consisted of fine silt/sand.
Comments: Left bank consists of clay and right bank consists of sand/clay. Suitable spawning substrate does not exist on this transect. **Photos:** 28 and 29.

Site 81.2:

Survey Cross-Section 0+00:
Waypoint 1: Water depth = 5.0 ft. Substrate consisted of silt/clay.
Waypoint 2: Water depth = 11.0 ft. Substrate consisted of coarse sand.
Waypoint 3: Water depth = 11.2 ft. Substrate consisted of coarse sand and pea gravel.
Comments: Left bank consists of clay and right bank consists of eroded sand and clay. Suitable spawning substrate does not exist on this transect. **Photos:** 30 and 31.

Survey Cross-Section 10+00:
Waypoint 4: Water depth = 16.5 ft. Substrate consisted of hard bottom (limerock).
Waypoint 5: Water depth = 27.0 ft. Substrate consisted of coarse sand.
Waypoint 6: Water depth = 7.5 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of limerock and hard clay boulders with fine sand in interstices. Right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 4 and 5. **Photos:** 32, 33, and 34.

Survey Cross-Section 20+00:
Waypoint 7: Water depth = 16.0 ft. Substrate consisted of hard bottom (clay/sand composite rock) with sand/silt/clay in interstices.
Waypoint 8: Water depth = 24.8 ft. Substrate consisted of hard bottom (clayrock).
Waypoint 9: Water depth = 16.5 ft. Substrate consisted of coarse sand and pea gravel.
Waypoint 10: Water depth = 7.5 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of hard clay/sand composite rock bluff and right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 8 and 9. **Photos:** 35, 36, and 37.

Survey Cross-Section 30+86:
Waypoint 11: Water depth = 11.0 ft. Substrate consisted of hard bottom (clay sandstone).
Waypoint 12: Water depth = 27.0 ft. Substrate consisted of coarse sand and pea gravel.

Waypoint 13: Water depth = 10.3 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of hard clay sandstone cliff and right bank consists of sand disposal area 117A. Suitable spawning substrate extends from left bank to midway between waypoints 11 and 12. **Photos:** 38, 39, and 1 (begin USFWS camera).

Survey Cross-Section 40+00:
Waypoint 14: Water depth = 18.0 ft. Substrate consisted of hard bottom (clayrock).
Waypoint 15: Water depth = 23.3 ft. Substrate consisted of coarse sand and pea gravel.
Waypoint 16: Water depth = 13.0 ft. Substrate consisted of coarse sand.
Comments: Left bank consists of hard clay sandstone ledge and right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 14 and 15. **Photos:** 2 and 3.

Survey Cross-Section 51+00:
Waypoint 17: Water depth = 3.5 ft. Substrate consisted of hard bottom (limerock/sandstone).
Waypoint 18: Water depth = 9.0 ft. Substrate consisted of hard bottom (limerock/sandstone).
Waypoint 19: Water depth = 18.0 ft. Substrate consisted of coarse sand.
Comments: Immediately downstream of Bristol boat ramp. Left bank consists of crushed limerock/sandstone bank protection and right bank consists of sand. Suitable spawning substrate extends from left bank to midway between waypoints 18 and 19. **Photos:** 4, 5, and 6.

Survey Cross-Section 52+73:
Waypoint 20: Water depth = 4.0 ft. Substrate consisted of fine sand.
Waypoint 21: Water depth = 13.0 ft. Substrate consisted of coarse sand, pea gravel, and fine gravel.
Waypoint 22: Water depth = 13.0 ft. Substrate consisted of coarse sand and fine sand.
Comments: Left bank consists of fine sand and scattered rock fragments and right bank consists of sand. Suitable spawning substrate does not exist on this transect. **Photos:** 7, 8, and 9.

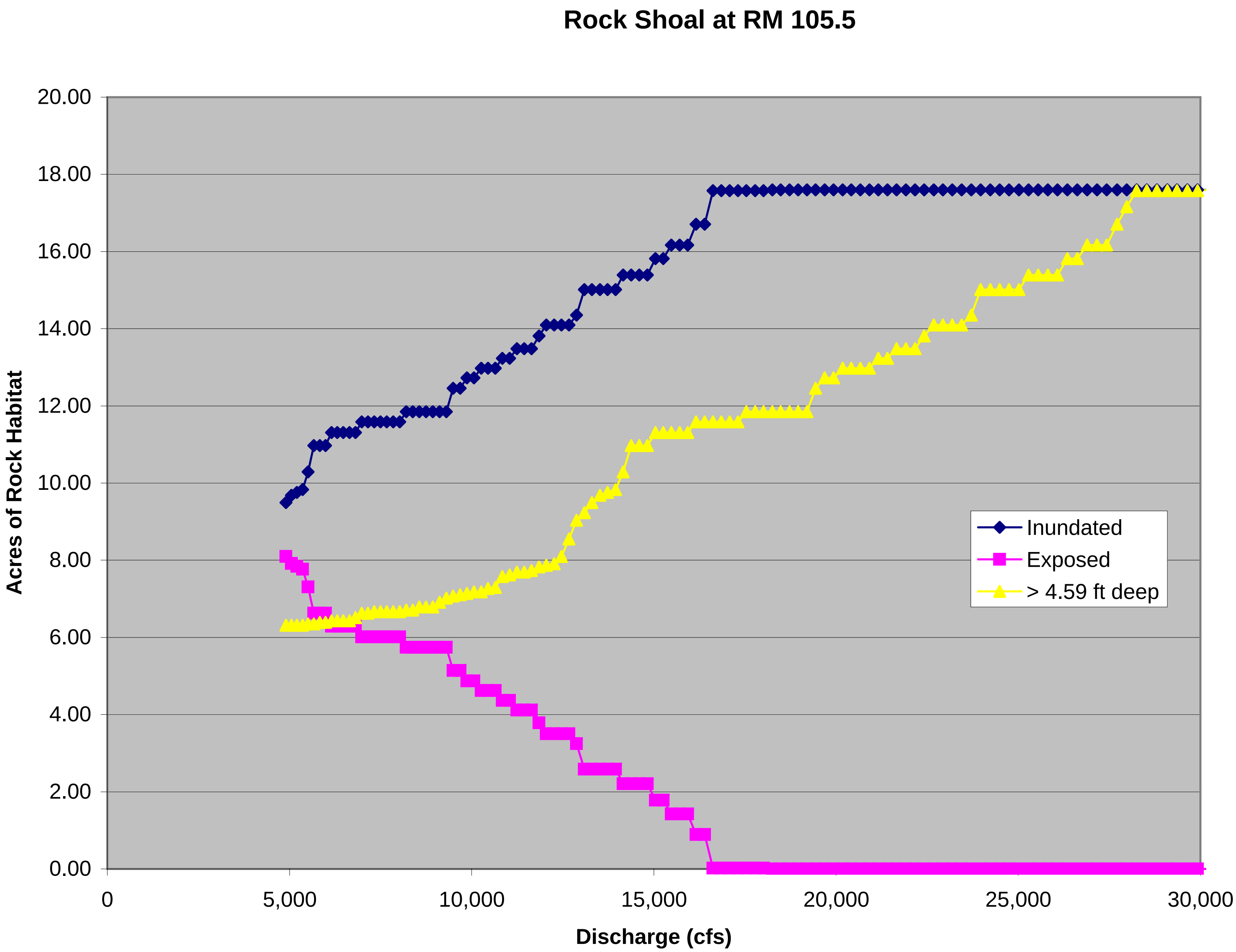
Enclosure 29

Areal Extent of Gulf Sturgeon Spawning Habitat
Inundated at NM 105

	Hard Bottom Acres		
Discharge	Inundated	Exposed	> 4.59 ft deep
4,900	9.50	8.10	6.32
5,051	9.68	7.91	6.32
5,203	9.76	7.84	6.32
5,357	9.83	7.77	6.32
5,513	10.29	7.31	6.35
5,670	10.97	6.62	6.35
5,829	10.97	6.62	6.39
5,989	10.97	6.62	6.39
6,150	11.31	6.29	6.43
6,313	11.31	6.29	6.43
6,478	11.31	6.29	6.43
6,644	11.31	6.29	6.43
6,812	11.31	6.29	6.51
6,980	11.59	6.01	6.63
7,151	11.59	6.01	6.63
7,323	11.59	6.01	6.67
7,496	11.59	6.01	6.67
7,670	11.59	6.01	6.67
7,846	11.59	6.01	6.67
8,024	11.59	6.01	6.67
8,203	11.85	5.74	6.71
8,383	11.85	5.74	6.71
8,564	11.85	5.74	6.79
8,747	11.85	5.74	6.79
8,931	11.85	5.74	6.79
9,116	11.85	5.74	6.91
9,303	11.85	5.74	7.02
9,491	12.46	5.14	7.07
9,681	12.46	5.14	7.11
9,871	12.73	4.87	7.14
10,060	12.73	4.87	7.18
10,260	12.98	4.62	7.18
10,450	12.98	4.62	7.27
10,650	12.98	4.62	7.30
10,840	13.23	4.36	7.58
11,040	13.23	4.36	7.62
11,240	13.48	4.11	7.69
11,440	13.48	4.11	7.69
11,640	13.48	4.11	7.73
11,850	13.81	3.79	7.83
12,050	14.10	3.50	7.87
12,260	14.10	3.50	7.91
12,460	14.10	3.50	8.10
12,670	14.10	3.50	8.55
12,880	14.35	3.24	9.04
13,090	15.01	2.58	9.23
13,300	15.01	2.58	9.50
13,520	15.01	2.58	9.68
13,730	15.01	2.58	9.76
13,950	15.01	2.58	9.83

14,160	15.39	2.21	10.29
14,380	15.39	2.21	10.97
14,600	15.39	2.21	10.97
14,820	15.39	2.21	10.97
15,040	15.82	1.78	11.31
15,260	15.82	1.78	11.31
15,480	16.17	1.43	11.31
15,710	16.17	1.43	11.31
15,930	16.17	1.43	11.31
16,160	16.71	0.89	11.59
16,390	16.71	0.89	11.59
16,620	17.58	0.02	11.59
16,850	17.58	0.02	11.59
17,080	17.58	0.02	11.59
17,310	17.58	0.02	11.59
17,540	17.58	0.02	11.85
17,780	17.58	0.02	11.85
18,010	17.58	0.02	11.85
18,250	17.60	0.00	11.85
18,480	17.60	0.00	11.85
18,720	17.60	0.00	11.85
18,960	17.60	0.00	11.85
19,200	17.60	0.00	11.85
19,440	17.60	0.00	12.46
19,690	17.60	0.00	12.73
19,930	17.60	0.00	12.73
20,180	17.60	0.00	12.98
20,420	17.60	0.00	12.98
20,670	17.60	0.00	12.98
20,920	17.60	0.00	12.98
21,160	17.60	0.00	13.23
21,410	17.60	0.00	13.23
21,660	17.60	0.00	13.48
21,920	17.60	0.00	13.48
22,170	17.60	0.00	13.48
22,420	17.60	0.00	13.81
22,680	17.60	0.00	14.10
22,930	17.60	0.00	14.10
23,190	17.60	0.00	14.10
23,450	17.60	0.00	14.10
23,710	17.60	0.00	14.35
23,970	17.60	0.00	15.01
24,230	17.60	0.00	15.01
24,490	17.60	0.00	15.01
24,750	17.60	0.00	15.01
25,020	17.60	0.00	15.01
25,280	17.60	0.00	15.39
25,550	17.60	0.00	15.39
25,810	17.60	0.00	15.39
26,080	17.60	0.00	15.39
26,350	17.60	0.00	15.82
26,620	17.60	0.00	15.82

26,890	17.60	0.00	16.17
27,160	17.60	0.00	16.17
27,430	17.60	0.00	16.17
27,710	17.60	0.00	16.71
27,980	17.60	0.00	17.16
28,250	17.60	0.00	17.58
28,530	17.60	0.00	17.58
28,810	17.60	0.00	17.58
29,090	17.60	0.00	17.58
29,360	17.60	0.00	17.58
29,640	17.60	0.00	17.58
29,920	17.60	0.00	17.58
30,210	17.60	0.00	17.60
30,490	17.60	0.00	17.60
30,770	17.60	0.00	17.60
31,060	17.60	0.00	17.60
31,340	17.60	0.00	17.60
31,630	17.60	0.00	17.60
31,910	17.60	0.00	17.60
32,200	17.60	0.00	17.60
32,490	17.60	0.00	17.60
32,780	17.60	0.00	17.60
33,070	17.60	0.00	17.60
33,360	17.60	0.00	17.60
33,660	17.60	0.00	17.60
33,950	17.60	0.00	17.60
34,240	17.60	0.00	17.60
34,540	17.60	0.00	17.60
34,830	17.60	0.00	17.60
35,130	17.60	0.00	17.60
35,430	17.60	0.00	17.60
35,730	17.60	0.00	17.60
36,030	17.60	0.00	17.60
36,330	17.60	0.00	17.60
36,630	17.60	0.00	17.60
36,930	17.60	0.00	17.60
37,230	17.60	0.00	17.60
37,540	17.60	0.00	17.60
37,840	17.60	0.00	17.60
38,150	17.60	0.00	17.60
38,450	17.60	0.00	17.60
38,760	17.60	0.00	17.60
39,070	17.60	0.00	17.60
39,380	17.60	0.00	17.60
39,690	17.60	0.00	17.60
40,000	17.60	0.00	17.60


Rock Shoal at RM 105.5
Acres of Rock Habitat
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
0
5,000
10,000
15,000
20,000
25,000
30,000
Discharge (cfs)
Inundated
Exposed
> 4.59 ft deep

Enclosure 30

FWS Sturgeon Eggs, Flow and Temperature Data, 2005

Date	Temp (C)
14-Mar-05	16.70
18-Mar-05	16.00
23-Mar-05	16.70
5-Apr-05	18.00
11-Apr-05	20.00
14-Apr-05	19.50
18-Apr-05	20.00
20-Apr-05	20.00
21-Apr-05	21.17
22-Apr-05	21.58
27-Apr-05	20.86
28-Apr-05	19.93
2-May-05	20.30
6-May-05	20.50
9-May-05	21.84
11-May-05	22.60
13-May-05	23.76
16-May-05	24.31

Date	Temp (^oC)	Stage (ft)	Eggs
1-Apr		70.05	
2-Apr			
3-Apr			
4-Apr			
5-Apr	18.0	68.9	
6-Apr		67.03	
7-Apr		65.43	
8-Apr		66.33	
9-Apr		66.78	
10-Apr		66.15	
11-Apr	20.0	63.7	
12-Apr		60.14	
13-Apr		57.02	
14-Apr	19.5	55.03	
15-Apr		54.36	
16-Apr		53.48	
17-Apr		53.2	
18-Apr	20.0	51.93	
19-Apr		49.38	
20-Apr	20.0	48.23	
21-Apr	21.2	48.71	
22-Apr	21.6	49.35	
23-Apr		49.12	
24-Apr		48.78	
25-Apr	20.47	49.69	
26-Apr		52.3	
27-Apr	20.9	53.05	53.05
28-Apr	19.9	52.94	
29-Apr	20.48	52.4	52.4
30-Apr		52.04	
1-May		52.15	
2-May	20.3	52.07	52.07
3-May		52.55	
4-May		53.18	
5-May		52.8	
6-May	20.5	51.75	
7-May		49.85	
8-May		48.34	
9-May	21.8	47.59	
10-May		47.41	
11-May	22.6	47.29	
12-May		47.3	
13-May	23.8	47.12	47.12
14-May		46.56	
15-May		46.37	
16-May	24.3	45.56	
17-May		45.3	
18-May		45.07	
19-May		45.01	
20-May		45.02	
21-May		45.28	

22-May	45.81
23-May	46.25
24-May	46.13
25-May	45.9
26-May	45.91
27-May	45.98
28-May	45.81
29-May	45.54
30-May	45.54

---------------------WARNING---------------------
The data you have obtained from this automated
U.S. Geological Survey database have not received
Director's approval and as such are provisional
and subject to revision. The data are released
on the condition that neither the USGS nor the
United States Government may be held liable for
any damages resulting from its use.
#
Additional information can be obtained from the USGS at
http://waterdata.usgs.gov/fl/nwis/help/?provisional
#
retrieved: 2005-05-31 16:13:56 EDT   Revised discharges substituted from a Feb. 06 download
#
This file consists of tab-separated columns of data for a list of sites.
Each site is separated by a header section of comments and a new column
header and format header section.
#
The column headers include the following fields
#
column   column definition
------------ --
agency_cd   Agency collection or maintaining the site
site_no   USGS site identification number
datetime   date and time in ISO format (YYYY-mm-dd)
#
The remaining fields vary for each site. The field names
use the following form '##_#####' where the first two numbers
uniquely define sensor (the 'data descriptor') and the
used to collect the data used to collect the data
and the 5 number sequence is the 'parameter_cd'
that defines the type of data shown in the column.
#
#
Data for the following stations is contained in this file

USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA
#
#
#
#
#
List of available data for this site. Lines preceeded by
an asterix '*' are included in the data file.
#
DD parameter statistic - Description
--   -----   -----   ------------------------------------
*02   00060   00003   - Discharge, cubic feet per second (Mean)
*03   00065   00003   - Gage height, feet (Mean)
#

agency_cd	site_no	datetime	03_00065_	02_00060_00003	
5s	15s	16s	14s	14s	temp

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USGS	2358000	1/3/2005	46.44	19800
USGS	2358000	1/4/2005	46.44	19800
USGS	2358000	1/5/2005	45.97	18700
USGS	2358000	1/6/2005	45.35	17200
USGS	2358000	1/7/2005	44.86	16100
USGS	2358000	1/8/2005	44.99	16400
USGS	2358000	1/9/2005	45.11	16600
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USGS	2358000	1/16/2005	50.68	31000
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USGS	2358000	1/19/2005	49.11	26600
USGS	2358000	1/20/2005	48.43	24800
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USGS	2358000	1/24/2005	45.14	16700
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USGS	2358000	2/24/2005	46.98	21100
USGS	2358000	2/25/2005	46.97	21100
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USGS	2358000	3/4/2005	52.13	35200
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USGS	2358000	3/13/2005	47.49	22400
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USGS	2358000	3/19/2005	48.85	25900
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USGS	2358000	4/15/2005	54.36	41900		
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USGS	2358000	4/25/2005	49.69	27100		
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USGS	2358000	4/27/2005	53.05	37400	53.05	37400
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USGS	2358000	5/4/2005	53.18	37800		
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USGS	2358000	5/6/2005	51.75	33200		
USGS	2358000	5/7/2005	49.85	27500		
USGS	2358000	5/8/2005	48.34	23500		
USGS	2358000	5/9/2005	47.59	21600		
USGS	2358000	5/10/2005	47.41	21100		
USGS	2358000	5/11/2005	47.29	20800		
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USGS	2358000	5/13/2005	47.12	20400	47.12	20400
USGS	2358000	5/14/2005	46.56	19000		
USGS	2358000	5/15/2005	46.37	18600		
USGS	2358000	5/16/2005	45.56	16700		
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USGS	2358000	5/18/2005	45.07	15600		
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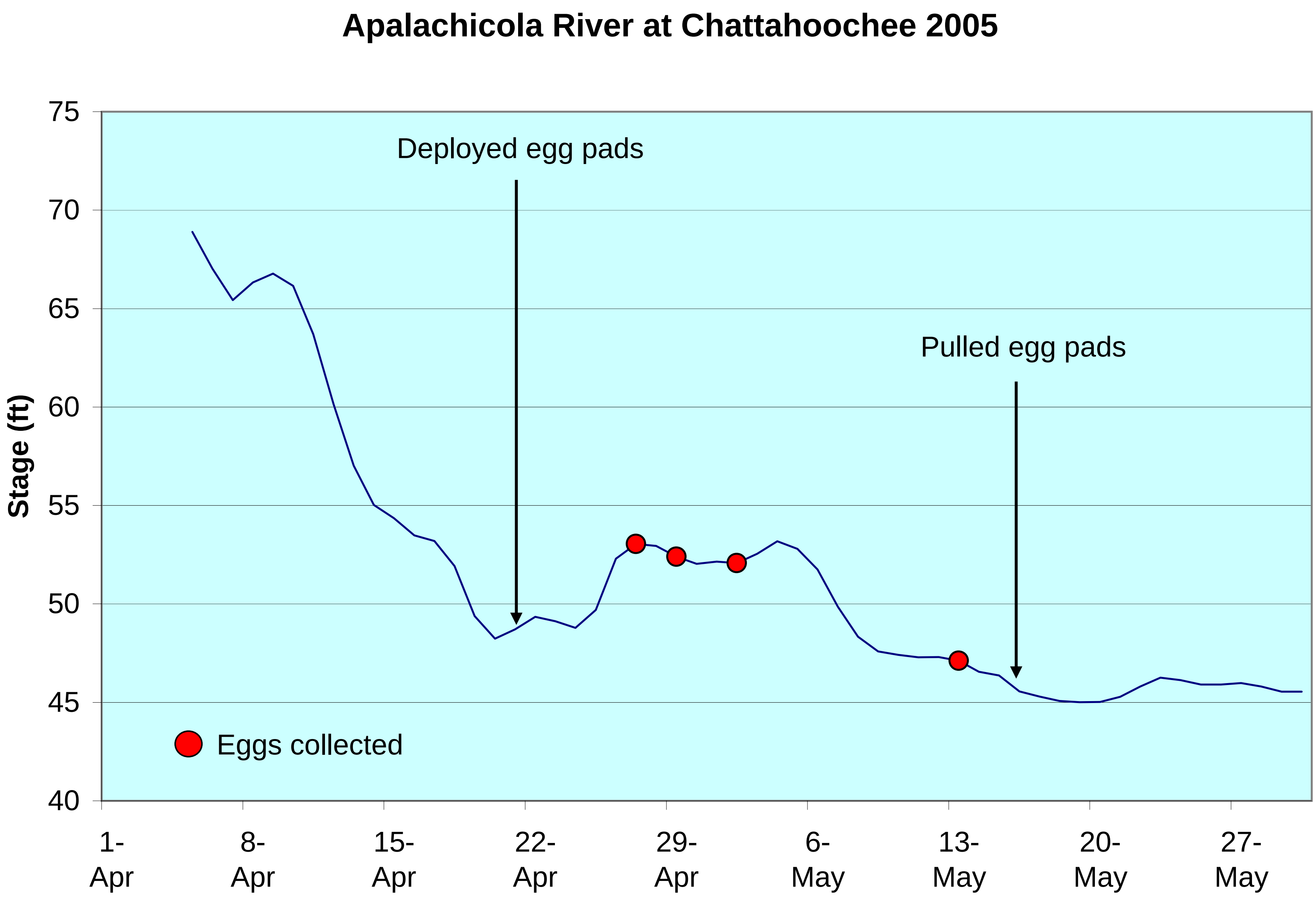
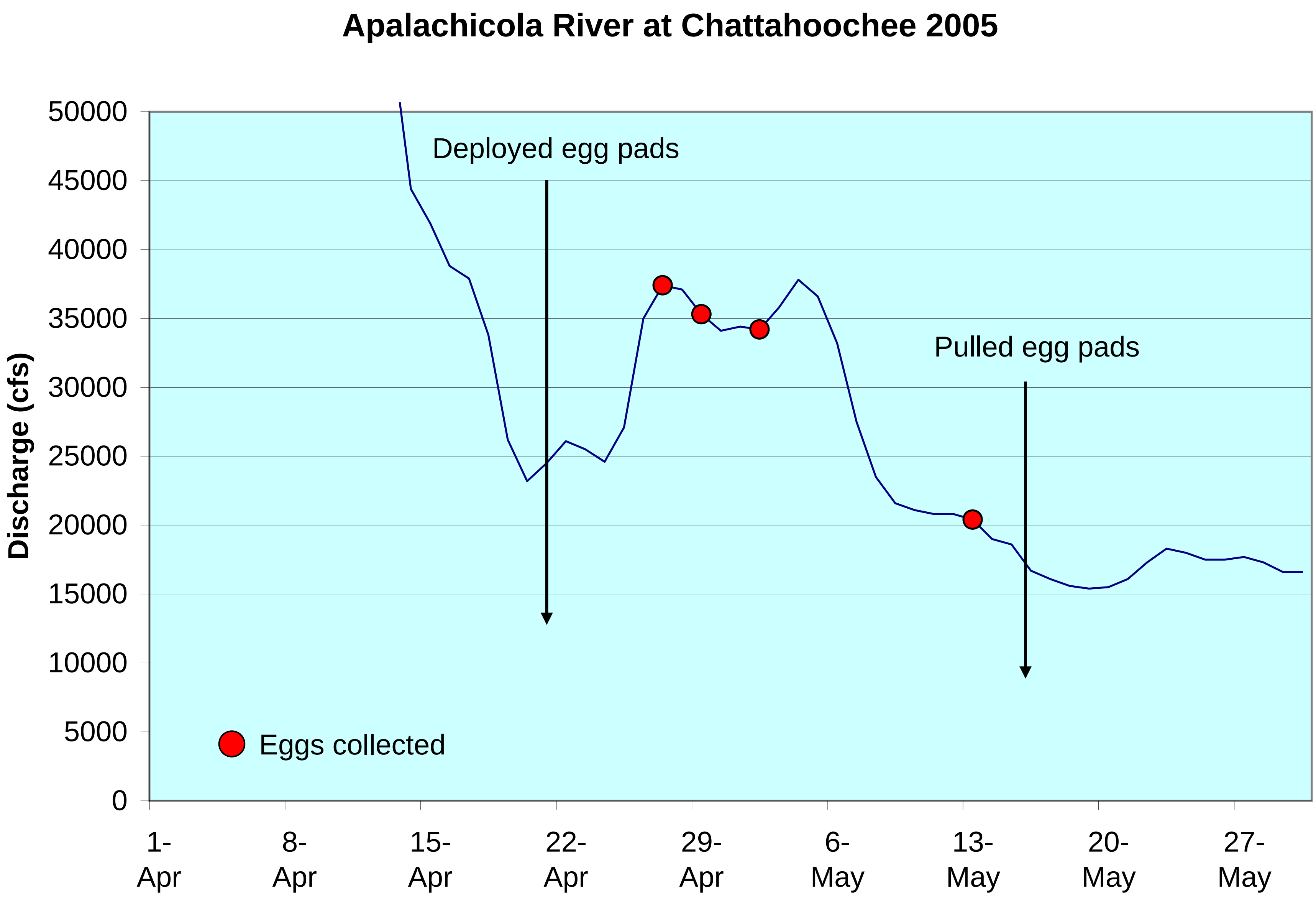
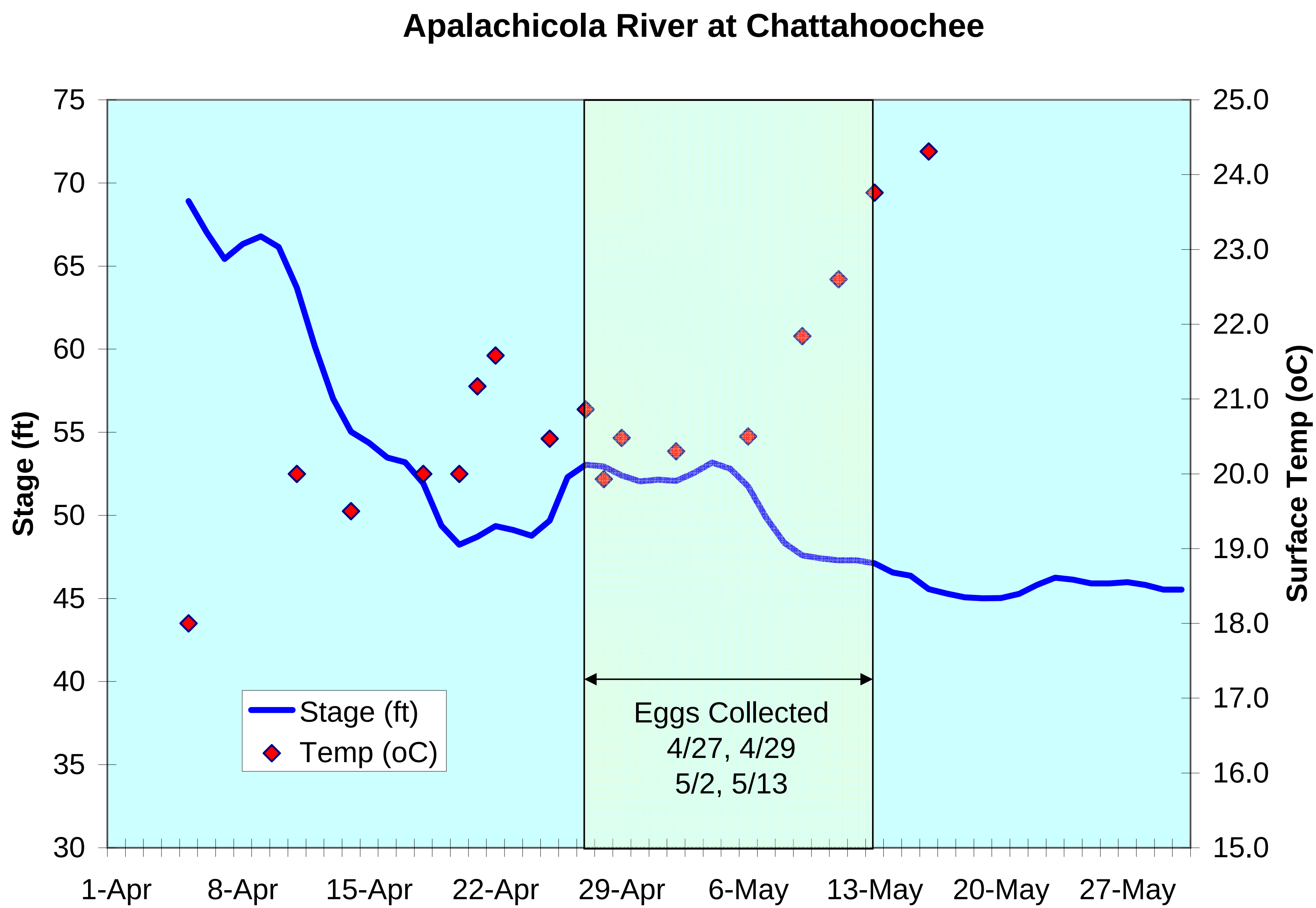
USGS	2358000	5/22/2005	45.81	17300		
USGS	2358000	5/23/2005	46.25	18300		
USGS	2358000	5/24/2005	46.13	18000		
USGS	2358000	5/25/2005	45.9	17500		
USGS	2358000	5/26/2005	45.91	17500		
USGS	2358000	5/27/2005	45.98	17700		
USGS	2358000	5/28/2005	45.81	17300		
USGS	2358000	5/29/2005	45.54	16600		
USGS	2358000	5/30/2005	45.54	16600		
		5/31/2005		16300		


Apalachicola River at Chattahoochee 2005
Stage (ft)
75
70
65
60
55
50
45
40
Deployed egg pads
Pulled egg pads
Eggs collected
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May


Apalachicola River at Chattahoochee 2005
Discharge (cfs)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Deployed egg pads
Pulled egg pads
Eggs collected
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May


Apalachicola River at Chattahoochee
Stage (ft)
Surface Temp (oC)
75
70
65
60
55
50
45
40
35
30
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
Stage (ft)
Temp (oC)
Eggs Collected
4/27, 4/29
5/2, 5/13

Enclosure 31

FWS Summary of Sturgeon Spawning Monitoring Data, 10 June 2005

Brandt, Joanne U SAM

From: Jerry_Ziewitz@fws.gov
Sent: Friday, June 10, 2005 11:09 AM
To: Brandt, Joanne U SAM; Zettle, Brian A SAM; Hoehn, Ted; Mesing, Charles; graham.lewis@nwfwmd.state.fl.us; sherrington@tnc.org; dan@abark.org; Allen, Micheal S.; bill_pine@mote.org; leitman@tds.net; Frank_Parauka@fws.gov; Jeff_Powell@fws.gov; hlight@usgs.gov; Ken_Sulak@usgs.gov
Subject: Prelim summary results Apalach sturgeon spawning study

Attachments: results summary.pdf

results
:ummary.pdf (15 KB

It will probably be the end of the summer before I'm able to write up a more formal paper on what we did and what we found this spring, so I've prepared a preliminary summary of some the results to share in the meantime with cooperators and supporters. Most of what I've included here is straight out of field notes with minimal analysis, so please treat this as a draft document and not the final word on anything. The more important "so-what" part is yet to come, including a full analysis of the habitat data we've been working on the last couple years.

I want to thank everyone who assisted with the tracking and egg sampling (Joanne/Brian: please share this email with others at the Corps who helped or are interested -- I don't have Katie's email, for example). Couldn't have done it without you.

Thanks,

Jerry

(See attached file: results summary.pdf)

2005 Apalachicola River Gulf Sturgeon Spawning Study
Preliminary Summary of Results

Radio Tracking

Tracked on 19 days between 3/14 and 5/16 covering a cumulative distance of 533 one-way miles, listening for about 43 hours. Once egg sampling began, when checking the pads we listened for tags going to and from the sample sites, sometimes tracking an additional distance downstream (usually to Ocheesee Landing).

We detected 7 of the 15 radio-tagged fish altogether, on 35 occasions. Fish were located at the dam and downstream as far as the Brothers River near the mouth of Bearman Creek.

First tag detections (2 fish) occurred in the upper river on 4/18.

On the third day that tagged fish were detected in this reach, we began sampling for eggs at two hard-bottom sites: 1) the rock shoals at rm 105.3; and 2) the limestone/marl bank/ledge at rm 97.8. No eggs were collected at the latter site, so at this time I have summarized only the results for the rock shoals site.

Sampling Results at the Rock Shoals

Up to 20 pads were deployed from 4/21 to 5/16 (duration 26 days).

Pads were checked on nine dates (4/25, 4/27, 4/28, 4/29, 5/2, 5/6, 5/9, 5/13, and 5/16), for a possible total of 180 samples (20 pads checked on 9 days), minus about 20 samples lost when pads were presumably carried away by high flows and were not immediately replaced.

Eggs were collected on four dates (4/27, 4/29, 5/2, and 5/13).

A total of 20 eggs and 1 larva were collected in 17 sample events (1 sample = checking 1 pad on 1 date) at 11 sample locations on the rock shoals. Spawning was also indicated at or near an additional 6 sample locations by the presence of hatched egg cases on the pads.

One pad yielded eggs on 3 dates; four other pads yielded eggs on 2 dates.

Depths of pads from which eggs/larvae were collected ranged from 7.5 to 20.1 ft (mean 11.7 ft, n=17).

Stages during the sample period varied from a low of 45.56 ft (on the last day of sampling, 5/16) to a high of 53.18 ft (on 5/4) (range = 7.62 ft) (source: provisional data from USGS Chattahoochee gage).

Depths sampled ranged from 21.7 ft (measured 4/29) to 1.5 ft (measured 5/16).

Enclosure 32

Updated Mussel Depth Distribution Tables for 3,000 cfs – 12,000 cfs

Table 4. Observed profile (10,000- 3,000 cfs) corresponding to survey dates. See Table 1 for sample site locations and methods section for discussion of how these data were obtained. WP = waypoint, NM = Navigation Mile, and nd = no data.

			Estimates, ft at specific discharges								
WP	**NM**	**Elev-**	**12,000 cfs**	**10,000 cfa**	**9,000 cfs**	**8,000 cfs**	**7,000 cfs**	**6,000 cfs**	**5,000 cfs**	**4,000 cfs**	**3,000 cfs**
Sumatra	20.3		4.12	3.62	3.3	2.9	2.6	2.2	1.8	1.1	0.5
145	30.0	6.9	7.4	6.5	6.1	5.4	4.8	3.8	3.5	2.8	2.1
Mile 35	35.0		9.1	8.0	7.5	6.7	5.9	4.7	4.4	3.7	3.0
156	41.5	13.0	13.8	12.8	12.0	11.4	10.4	9.4	9.1	8.4	7.7
Wewa	44.2		15.7	14.8	13.9	13.4	12.3	11.3	11	10.3	9.6
155	46.8	16.2	16.9	16.0	15.1	14.6	13.6	12.5	12.2	11.5	10.8
150	48.4	16.9	17.7	16.8	15.8	15.3	14.3	13.3	13.0	12.3	11.6
152	48.4	16.9	17.7	16.8	15.8	15.3	14.3	13.3	13.0	12.3	11.6
153	49.0	17.2	18.0	17.1	16.1	15.6	14.6	13.6	13.3	12.6	11.9
154	53.4	19.3	20.1	19.2	18.1	17.7	16.7	15.7	15.4	14.7	14.0
158	73.3	29.5	29.7	28.6	27.7	27.0	26.3	25.2	24.9	24.2	23.5
159	73.3	29.5	29.7	28.6	27.7	27.0	26.3	25.2	24.9	24.2	23.5
160	73.3	29.5	29.7	28.6	27.7	27.0	26.3	25.2	24.9	24.2	23.5
Blountstown	78.0		32.0	30.9	29.9	29.2	28.6	27.5	27.1	26.4	25.7
Chattahoochee	106.0		43.0	42.0	41.4	40.9	40.3	39.7	39.1	38.4	37.7

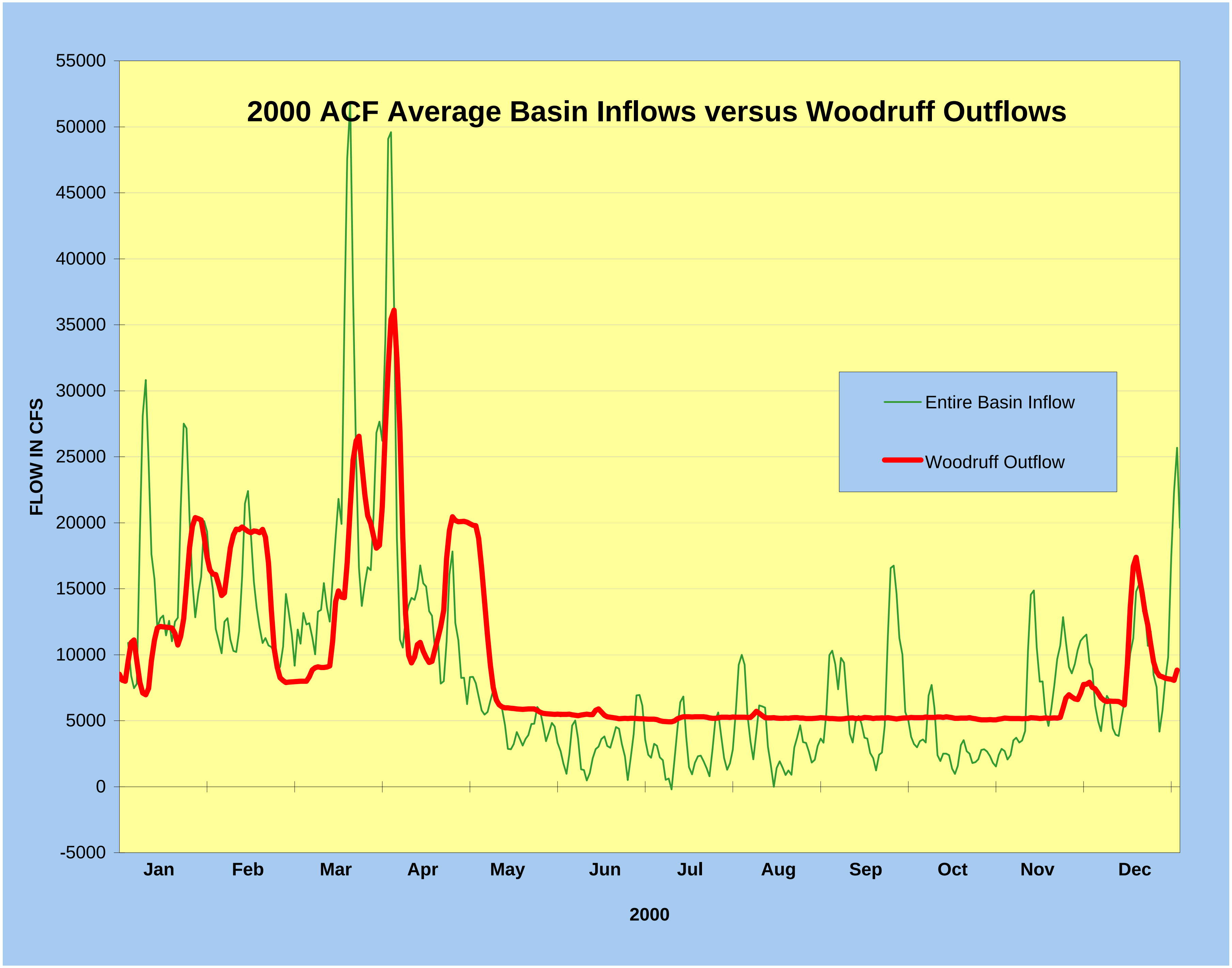
Table 5. Estimated water level loss (feet) at sites surveyed in November 2003 at various discharge values. At 12,000 cfs the elevation would be higher than when the mussel data were collected.										
WP	**NM**	**Observed Profiles @ 12,000 cfs**	**Observed Profiles @ 10,000 cfs**	**Observed Profiles @ 9,000 cfs**	**Observed Profiles @ 8,000 cfs**	**Observed Profiles @ 7,000 cfs**	**Observed Profile @ 6,000 cfs**	**Observed Profile @ 5,000 cfs**	**Elev at 4,000 CFS**	**Elev at 3,000 CFS**
145	30.0	-0.5	0.4	0.8	1.5	2.1	3.0	3.4	4.1	4.7
156	41.5	-0.7	0.2	1.0	1.6	2.6	3.6	3.9	4.6	5.3
155	46.8	-0.8	0.1	1.1	1.6	2.6	3.6	3.9	4.6	5.3
150	48.4	-0.8	0.1	1.1	1.6	2.5	3.6	3.9	4.6	5.3
152	48.4	-0.8	0.1	1.1	1.6	2.5	3.6	3.9	4.6	5.3
153	49.0	-0.8	0.1	1.1	1.6	2.5	3.6	3.9	4.6	5.3
154	53.4	-0.8	0.1	1.2	1.6	2.5	3.6	3.9	4.6	5.3
158	73.3	-0.2	0.9	1.8	2.5	3.2	4.3	4.6	5.3	6.0
159	73.3	-0.2	0.9	1.8	2.5	3.2	4.3	4.7	5.4	6.1
160	73.3	-0.2	0.9	1.8	2.5	3.2	4.3	4.7	5.4	6.1

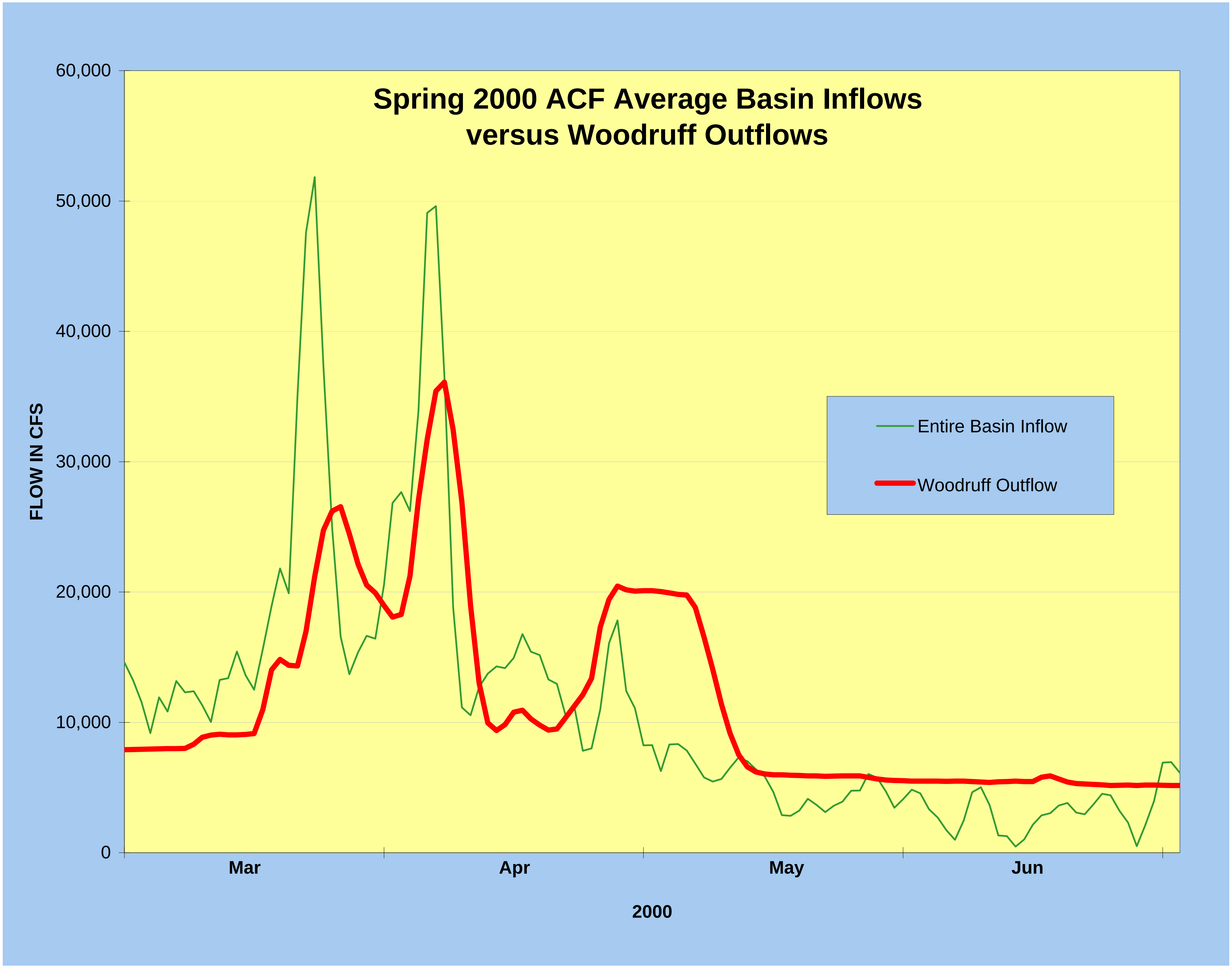
Table 6. An estimate of the percentage of *A. neislerii* that would be exposed to the atmosphere at three locations at discharges of 3,000-10,000 cfs, Apalachicola River, Florida, 2003.										
			Discharge, cfs							
Location	**NM**	**Estimated Mussels**	**3,000**	**4,000**	**5,000**	**6,000**	**7,000**	**8,000**	**9,000**	**10,000**
A	30.0	11.0	6.1	5.2	2.1	0.0	0.0	0.0	0.0	0.0
B	41.5	42.6	42.6	36.3	32.8	25.5	6.6	0.0	0.0	0.0
B	41.5	3.0	3.0	2.6	2.3	1.8	0.5	0.0	0.0	0.0
B	46.8	3.8	3.8	3.2	2.9	2.3	0.6	0.0	0.0	0.0
B	48.4	5.3	5.3	4.5	4.1	3.2	0.8	0.0	0.0	0.0
B	48.4	1.5	1.5	1.3	1.2	0.9	0.2	0.0	0.0	0.0
B	49.0	3.0	3.0	2.6	2.3	1.8	0.5	0.0	0.0	0.0
C	73.3	10.5	8.8	7.0	4.9	3.6	1.6	0.8	0.0	0.0
C	73.3	1.0	0.8	0.7	0.5	0.4	0.1	0.1	0.0	0.0
C	73.3	34.7	29.2	23.1	16.1	13.5	5.1	2.6	0.0	0.0
An estimate of the percentage of *A. neislerii* that would be exposed to the atmosphere at three locations at discharges of 3,000 –10,000 cfs, Apalachicola River, Florida, 2003.										
			3,000	**4,000**	**5,000**	**6,000**	**7,000**	**8,000**	**9,000**	**10,000**
A			55.0	47.0	19.1	0.0	0.0	0.0	0.0	0.0
B			100.0	85.1	77.0	59.8	15.4	0.0	0.0	0.0
C			84.1	66.5	46.3	33.9	14.8	7.4	0.0	0.0
Locations A, B, and C, include sites at the following Navigation Miles:										

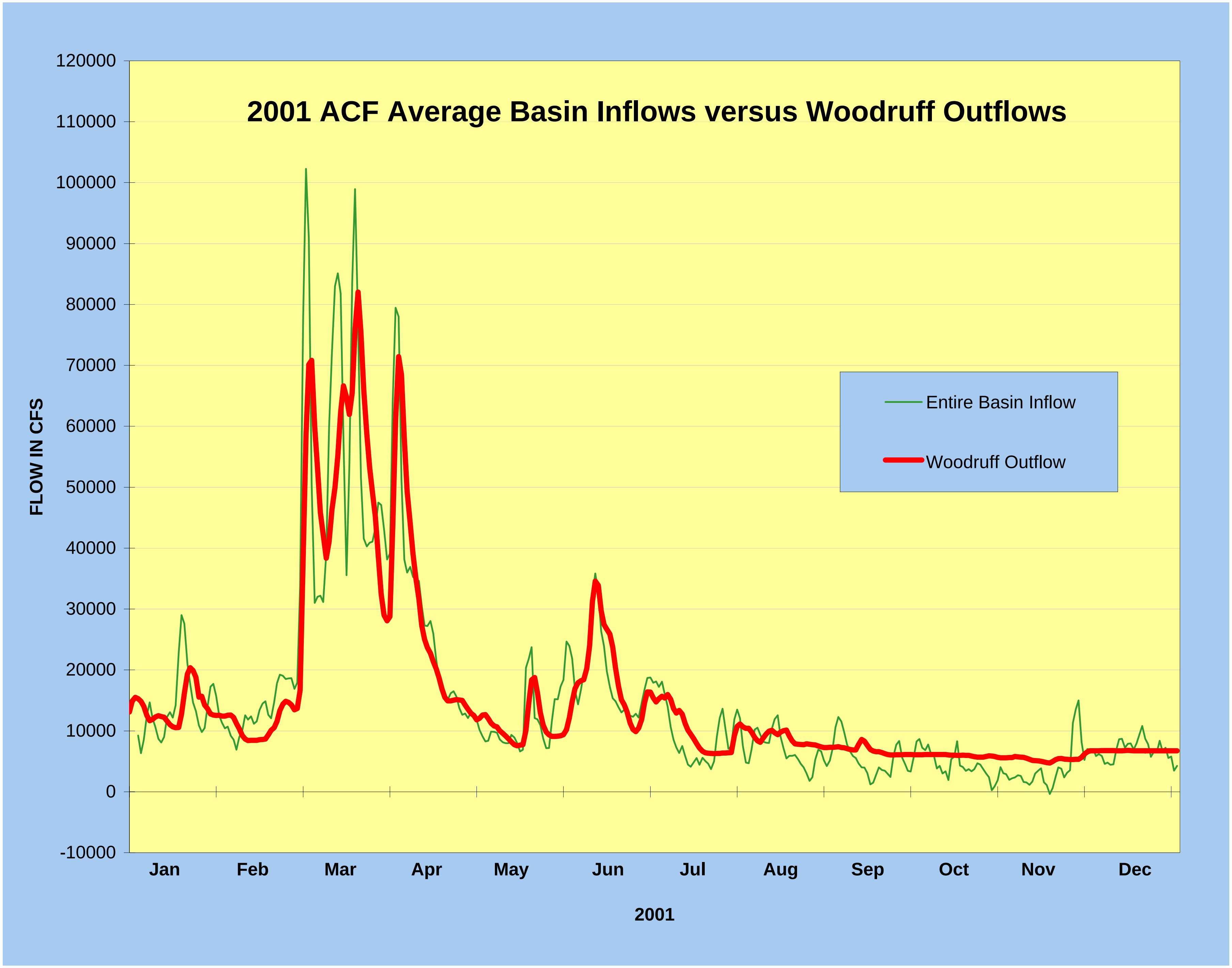
A	30.0
B	41.5, 46.8, 48.4, 49.0
C	73.3

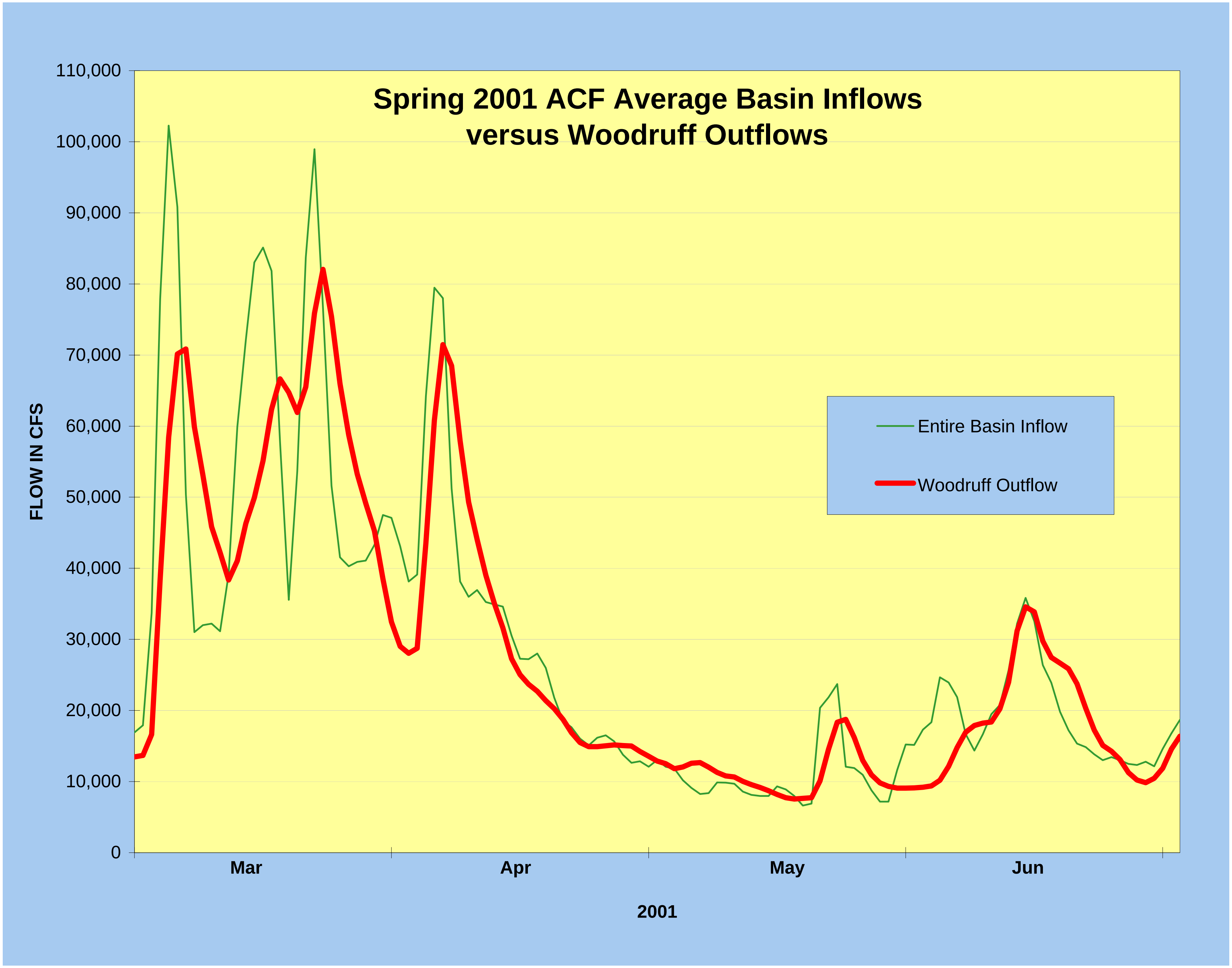
Enclosure 33

ACF Basin Inflows vs. Jim Woodruff Dam Releases, 2000 – 2005

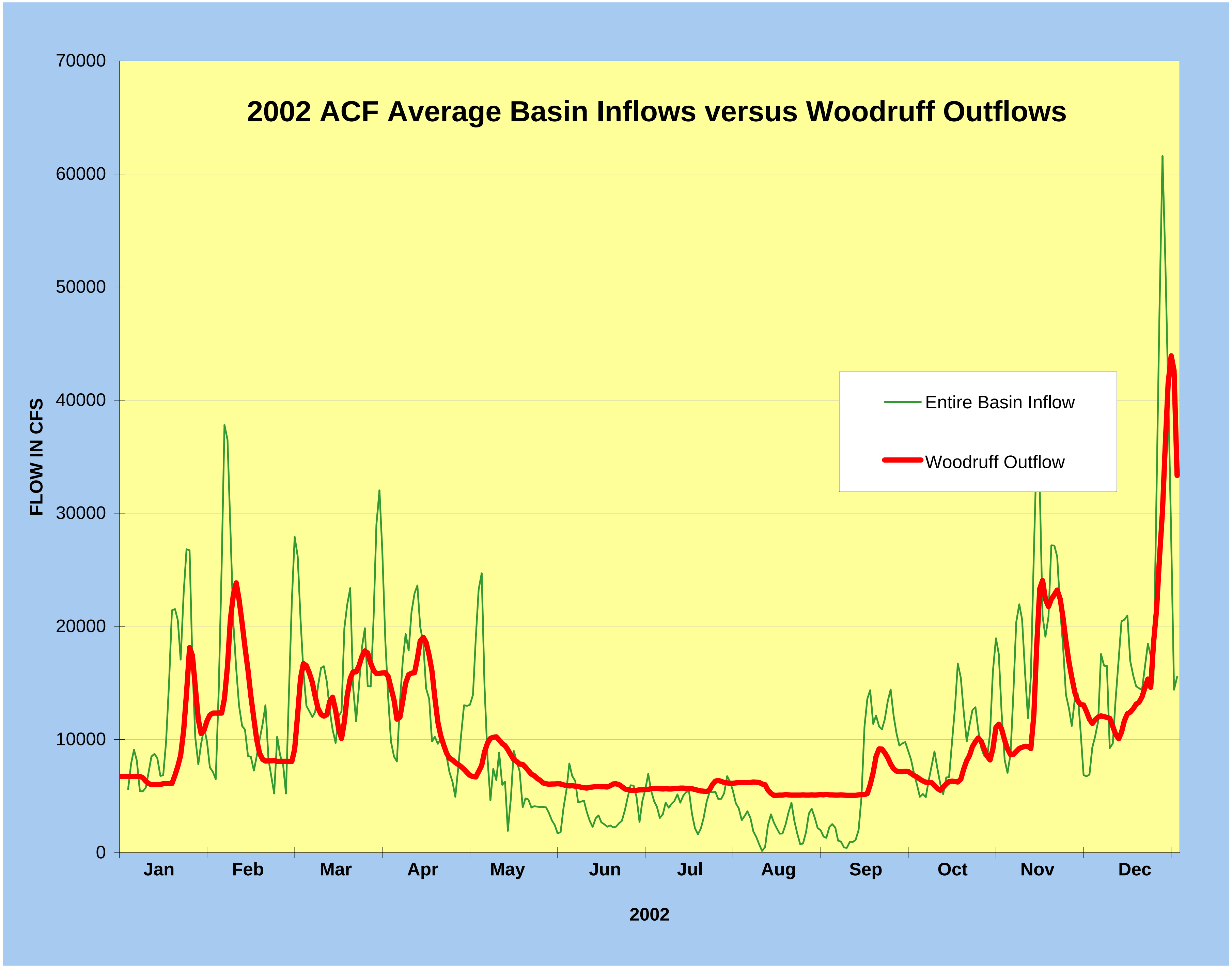

2000 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
Entire Basin Inflow
Woodruff Outflow
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2000

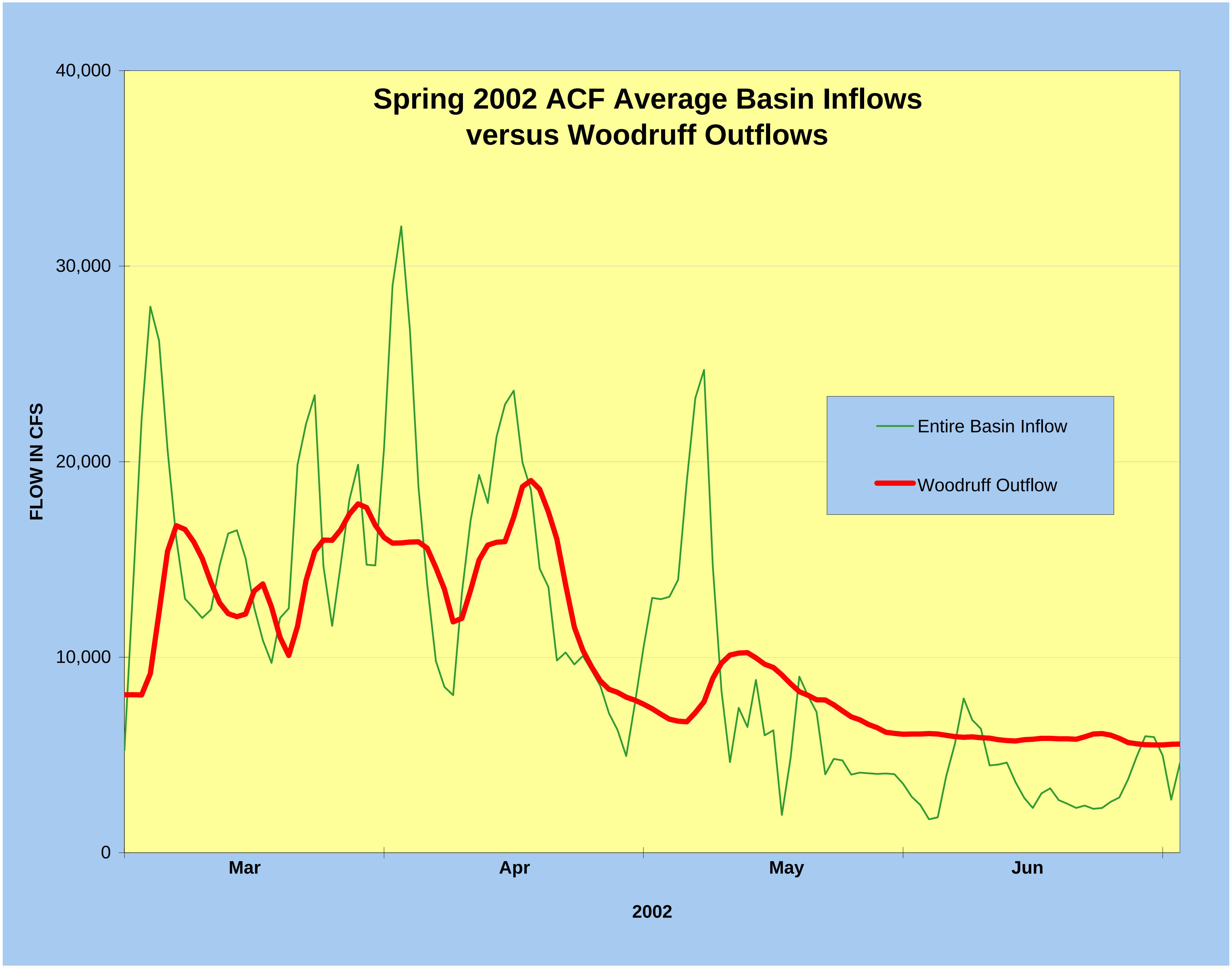

Spring 2000 ACF Average Basin Inflows
versus Woodruff Outflows
FLOW IN CFS
60,000
50,000
40,000
30,000
20,000
10,000
0
Entire Basin Inflow
Woodruff Outflow
Mar
Apr
May
Jun
2000


2001 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2001
Entire Basin Inflow
Woodruff Outflow

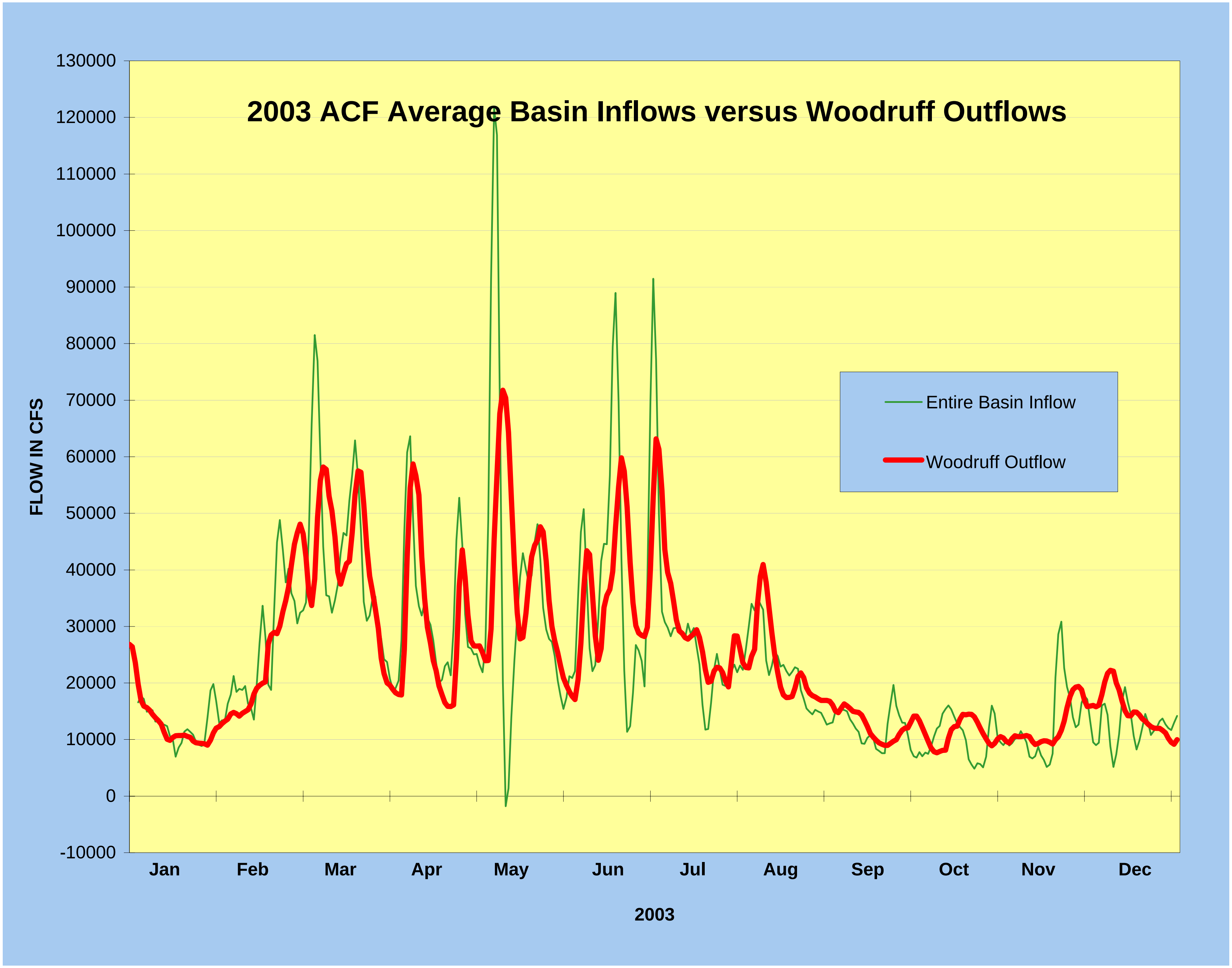


Spring 2001 ACF Average Basin Inflows
versus Woodruff Outflows
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
FLOW IN CFS
Entire Basin Inflow
Woodruff Outflow
Mar
Apr
May
Jun
2001

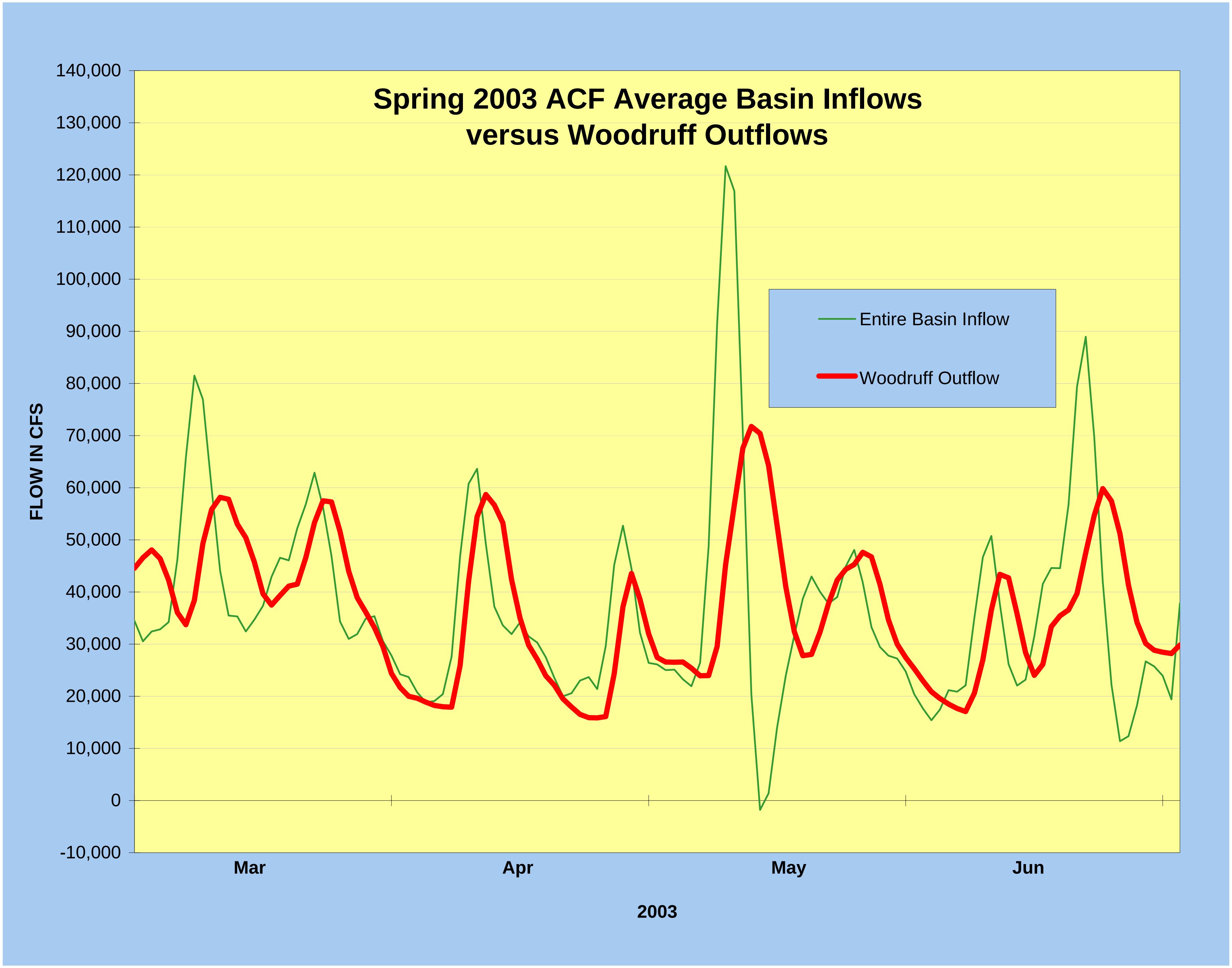

2002 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
70000
60000
50000
40000
30000
20000
10000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2002
Entire Basin Inflow
Woodruff Outflow

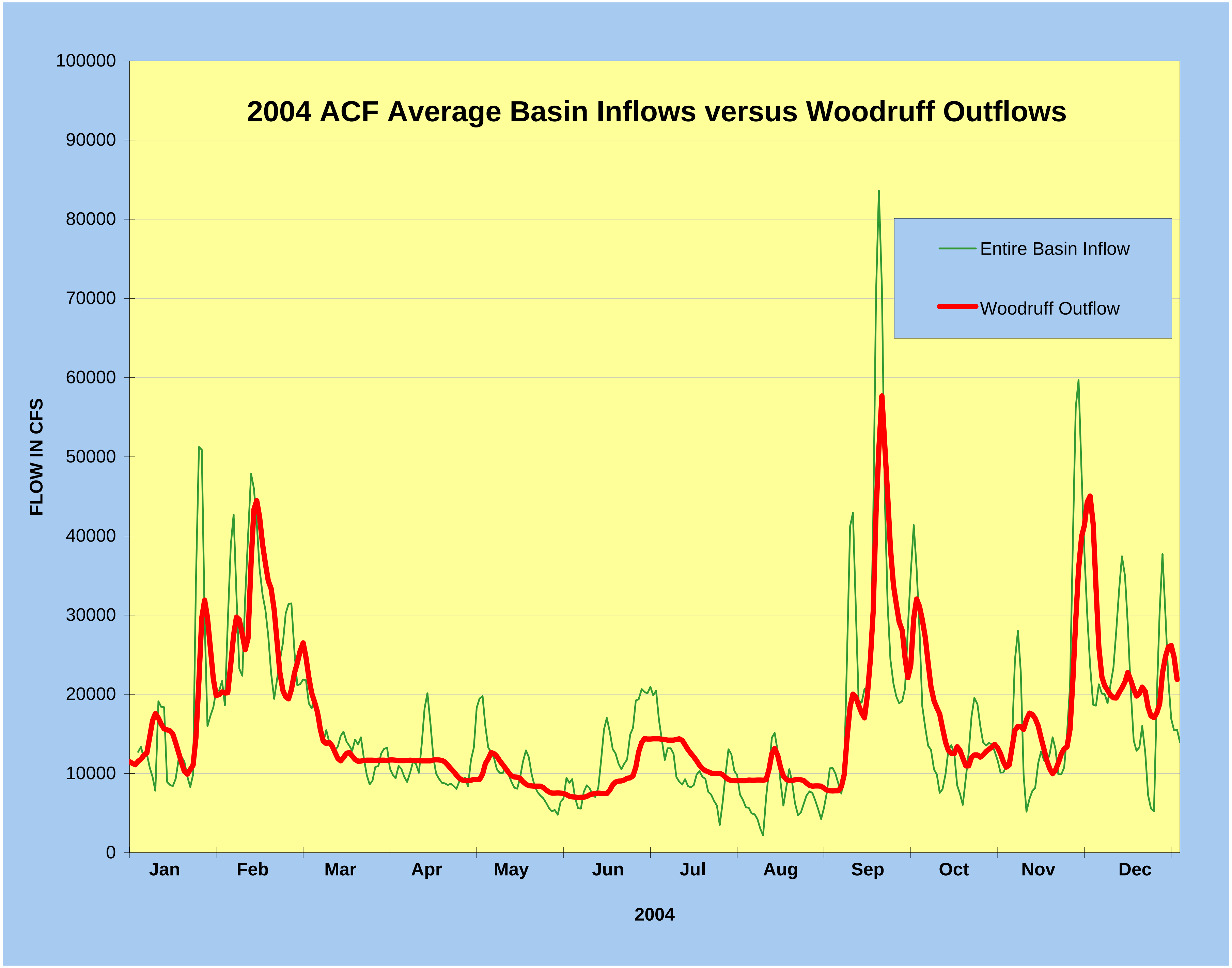


Spring 2002 ACF Average Basin Inflows
versus Woodruff Outflows
40,000
30,000
20,000
10,000
0
FLOW IN CFS
Entire Basin Inflow
Woodruff Outflow
Mar
Apr
May
Jun
2002

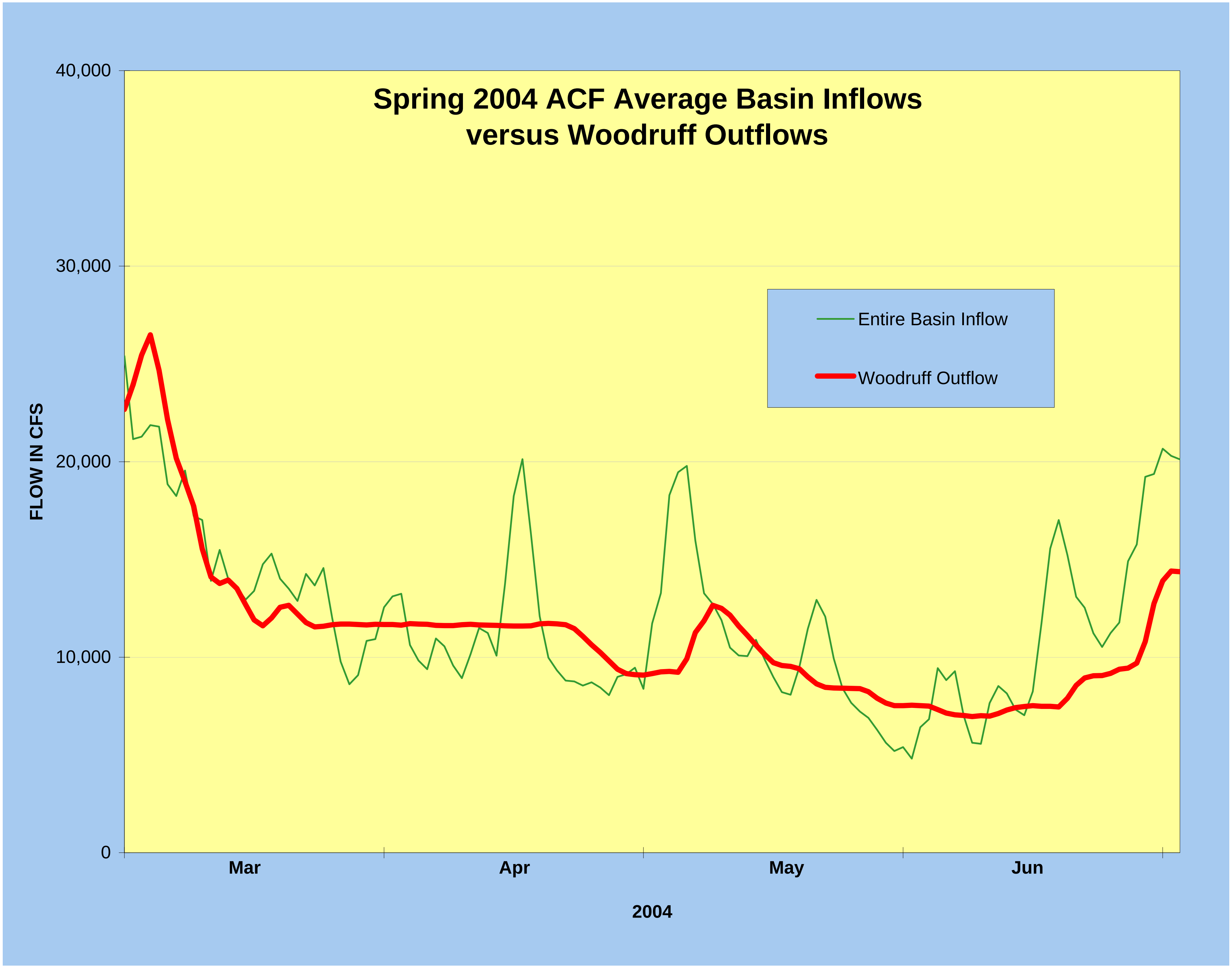


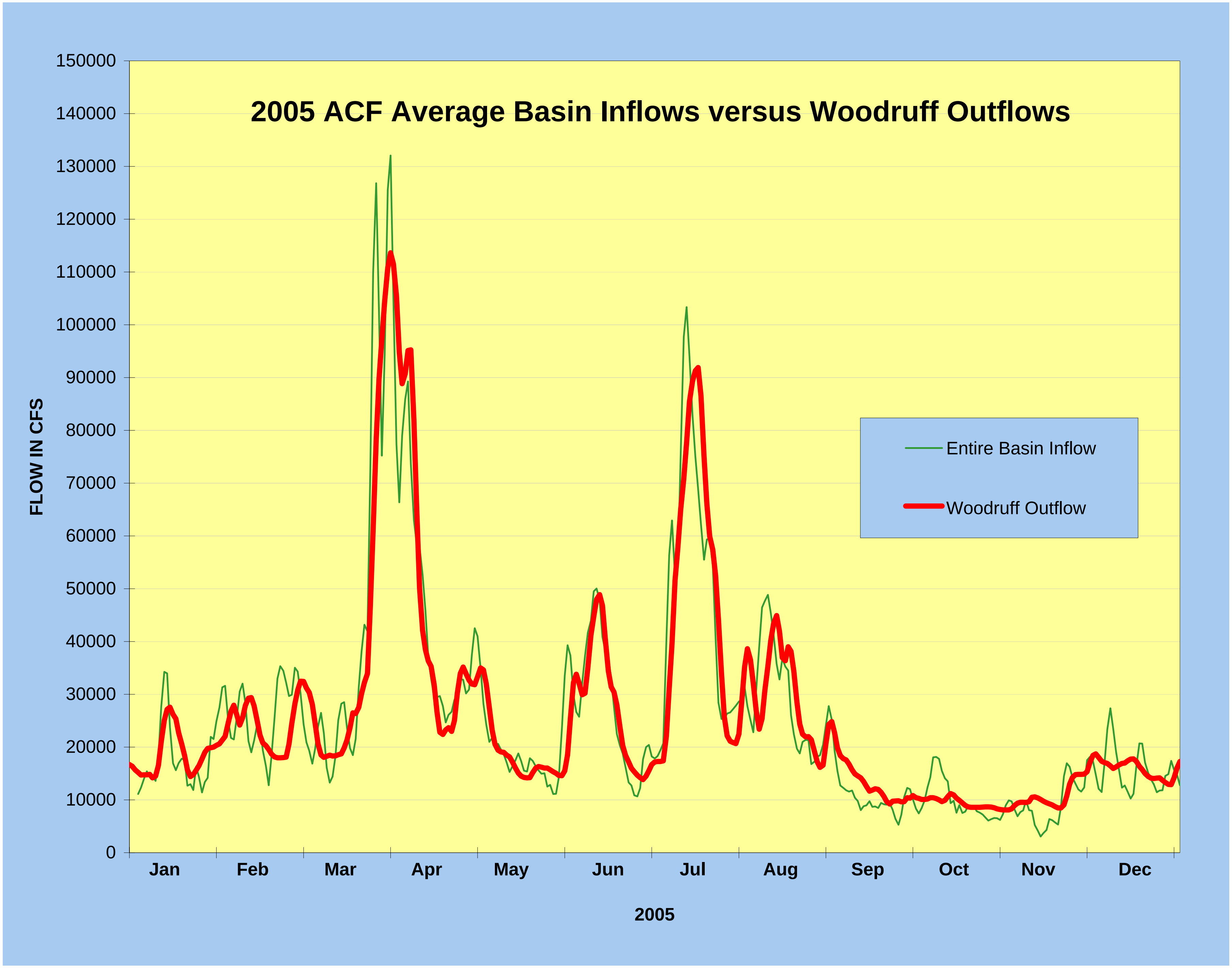
2003 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
130000
120000
110000
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
-10000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2003
Entire Basin Inflow
Woodruff Outflow

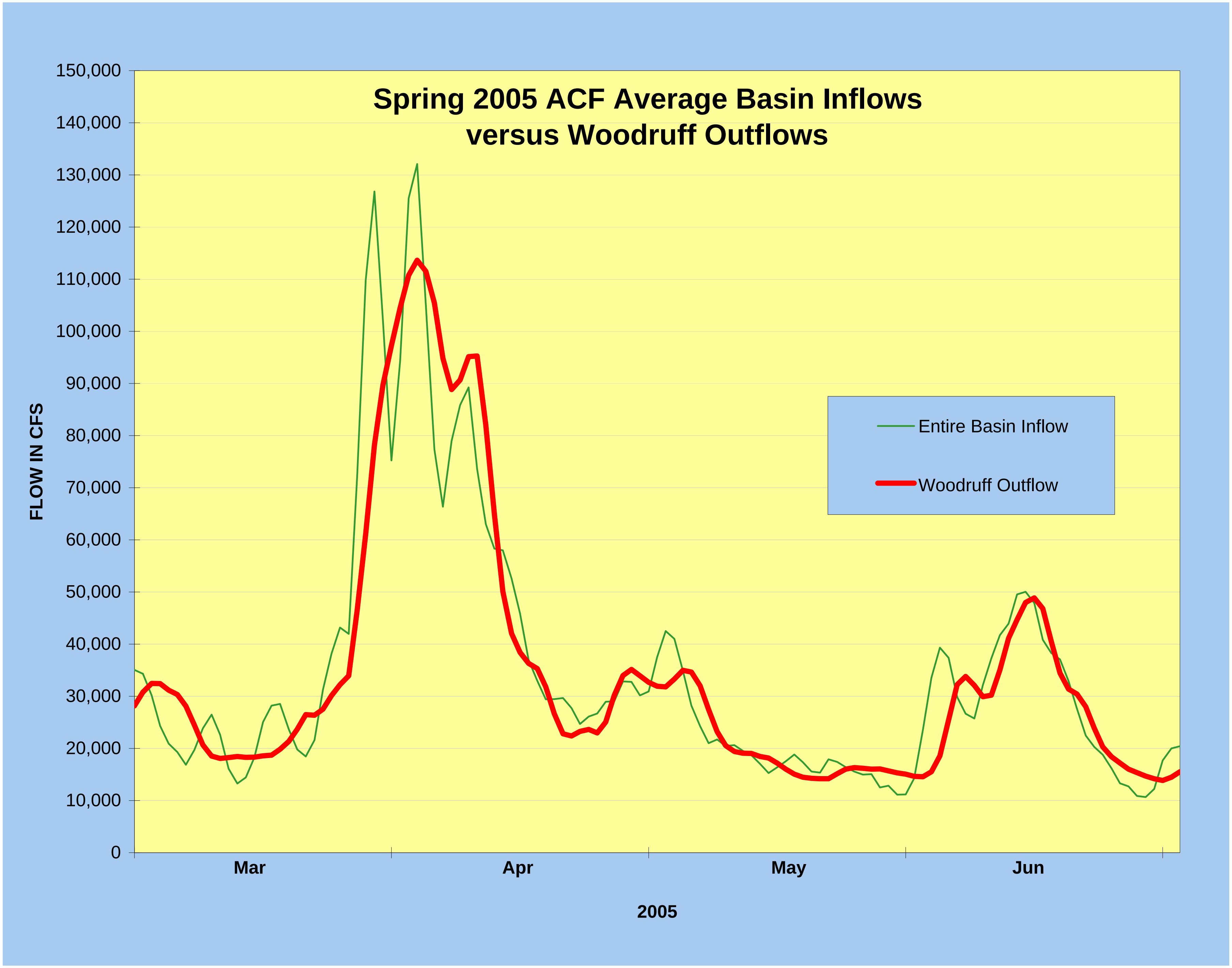

Spring 2003 ACF Average Basin Inflows
versus Woodruff Outflows
FLOW IN CFS
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
-10,000
Entire Basin Inflow
Woodruff Outflow
Mar
Apr
May
Jun
2003



2004 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2004
Entire Basin Inflow
Woodruff Outflow

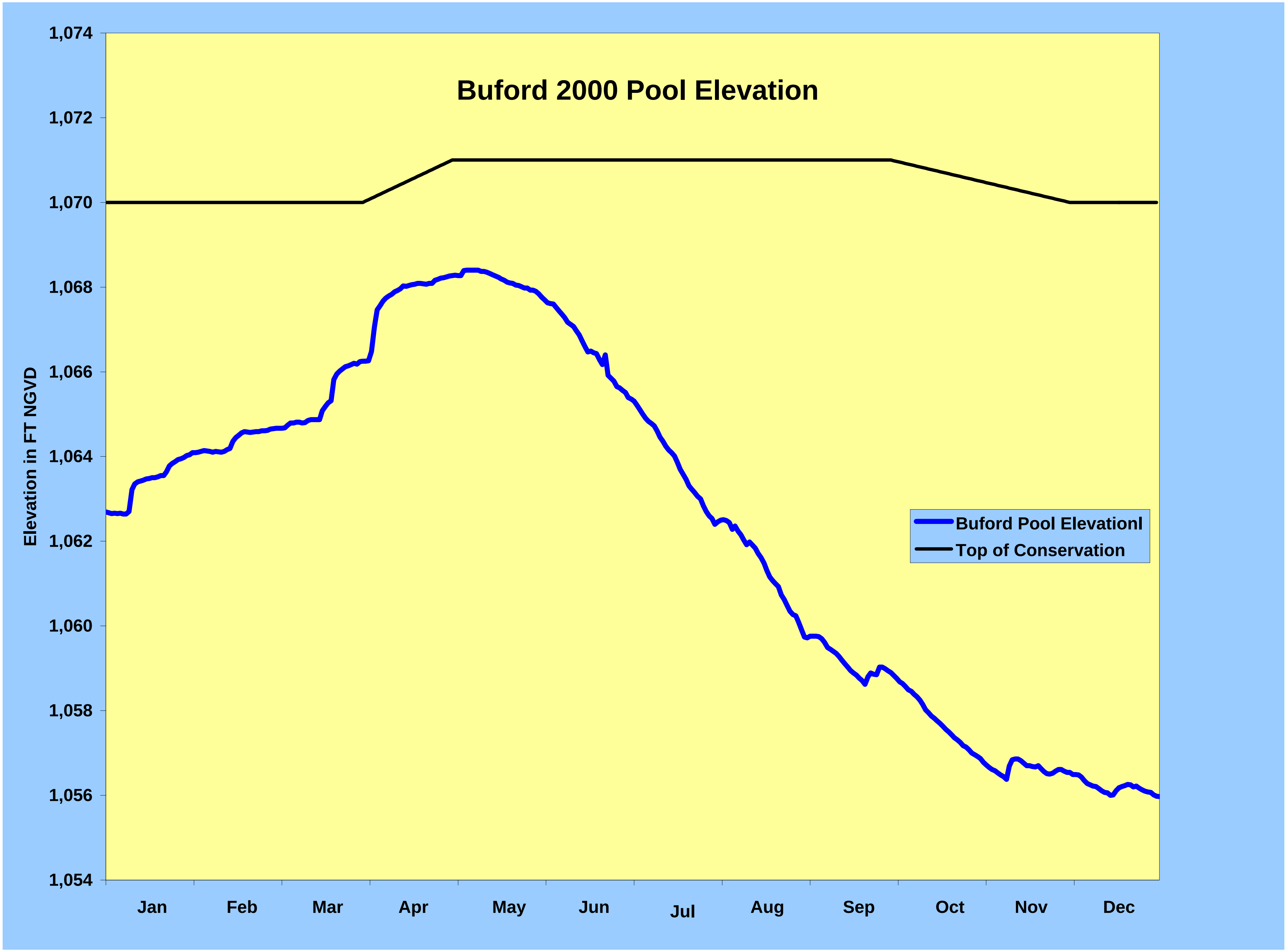

Spring 2004 ACF Average Basin Inflows
versus Woodruff Outflows
Entire Basin Inflow
Woodruff Outflow
FLOW IN CFS
40,000
30,000
20,000
10,000
0
Mar
Apr
May
Jun
2004


2005 ACF Average Basin Inflows versus Woodruff Outflows
FLOW IN CFS
0
10000
20000
30000
40000
50000
60000
70000
80000
90000
100000
110000
120000
130000
140000
150000
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
2005
Entire Basin Inflow
Woodruff Outflow

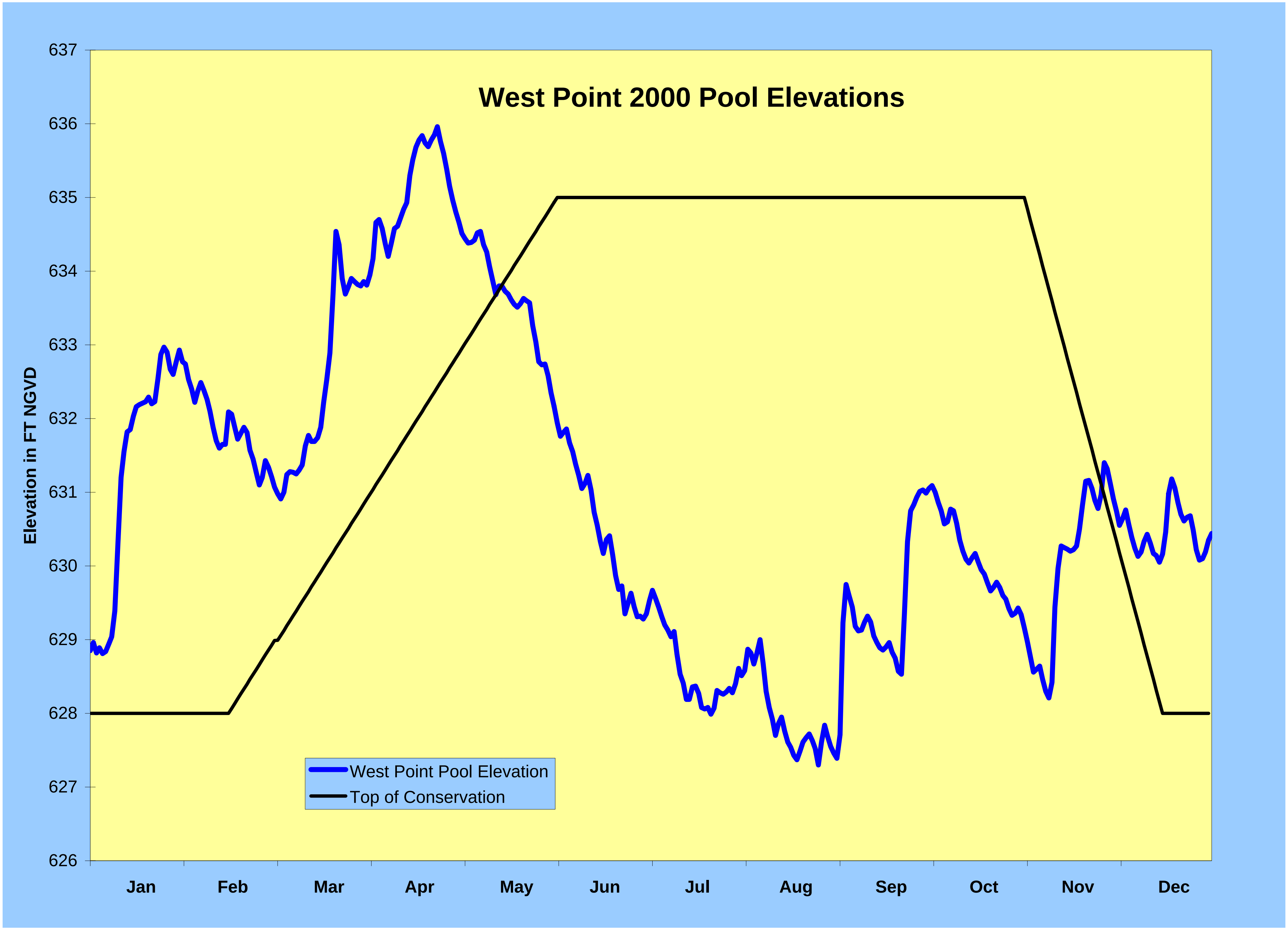

Spring 2005 ACF Average Basin Inflows
versus Woodruff Outflows
FLOW IN CFS
150,000
140,000
130,000
120,000
110,000
100,000
90,000
80,000
70,000
60,000
50,000
40,000
30,000
20,000
10,000
0
Mar
Apr
May
Jun
2005
Entire Basin Inflow
Woodruff Outflow

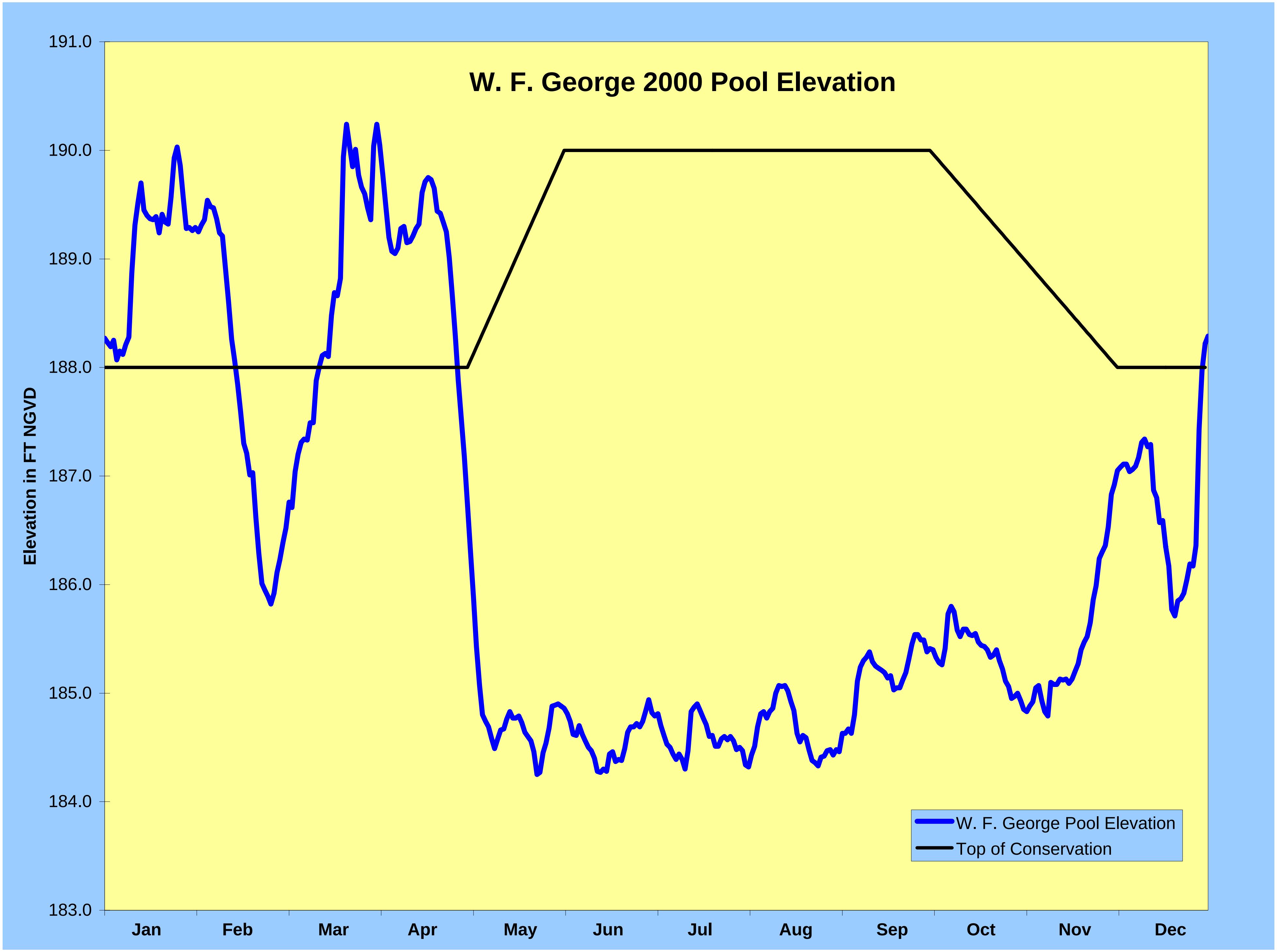
Enclosure 34

ACF Basin Reservoir Levels, 2000 – 2005

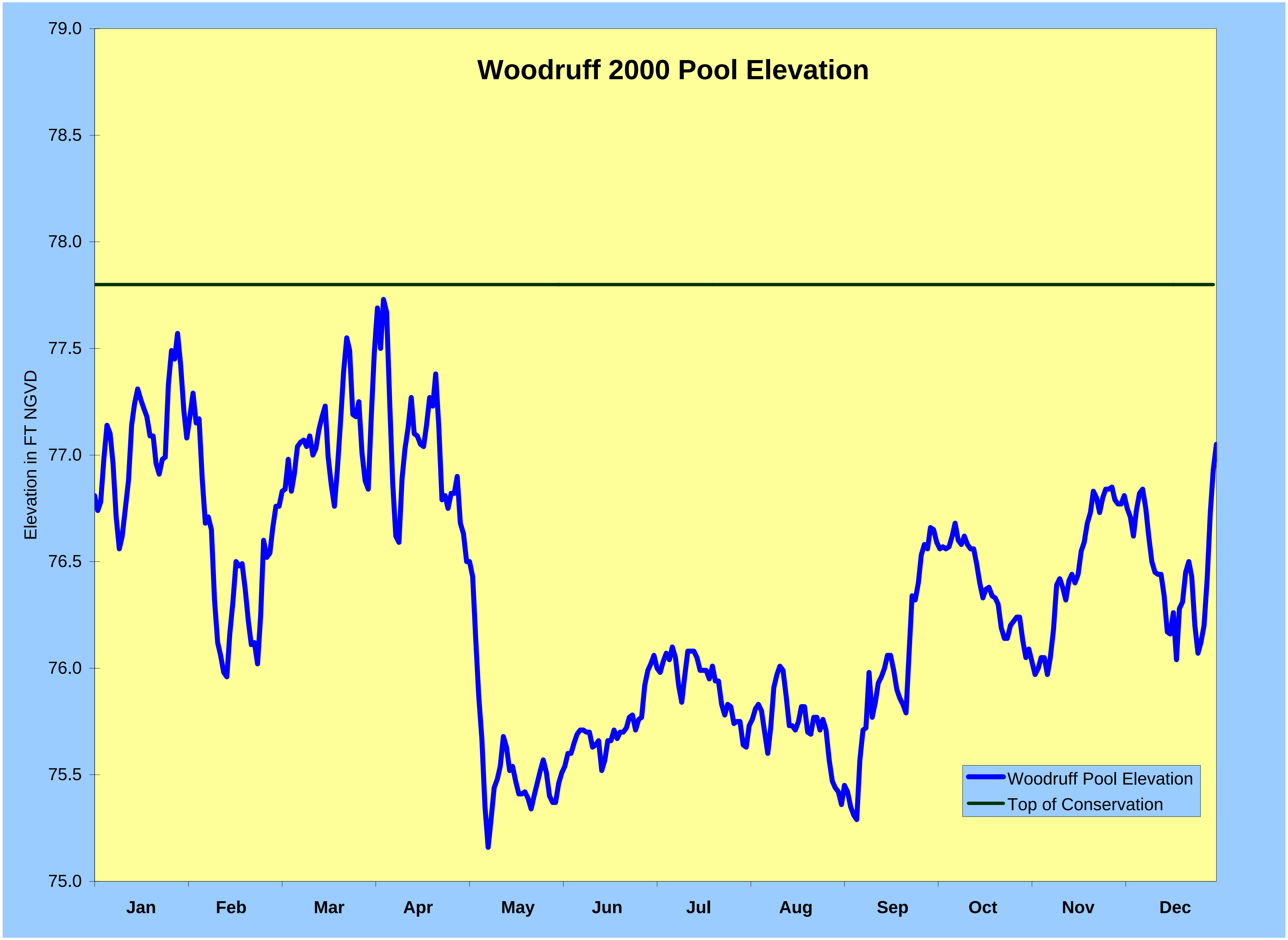


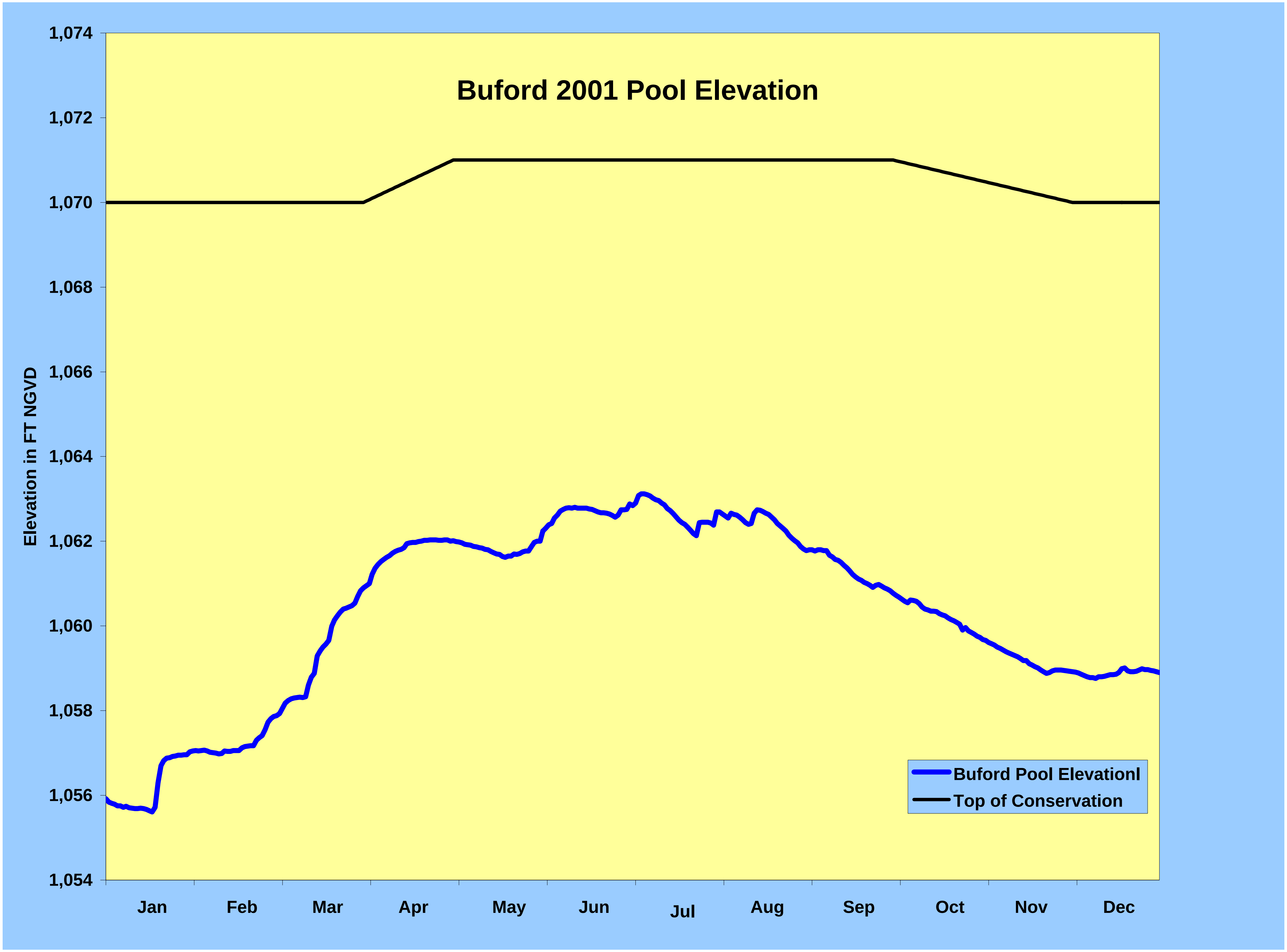
Buford 2000 Pool Elevation
Elevation in FT NGVD
1,074
1,072
1,070
1,068
1,066
1,064
1,062
1,060
1,058
1,056
1,054
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Buford Pool Elevationl
Top of Conservation

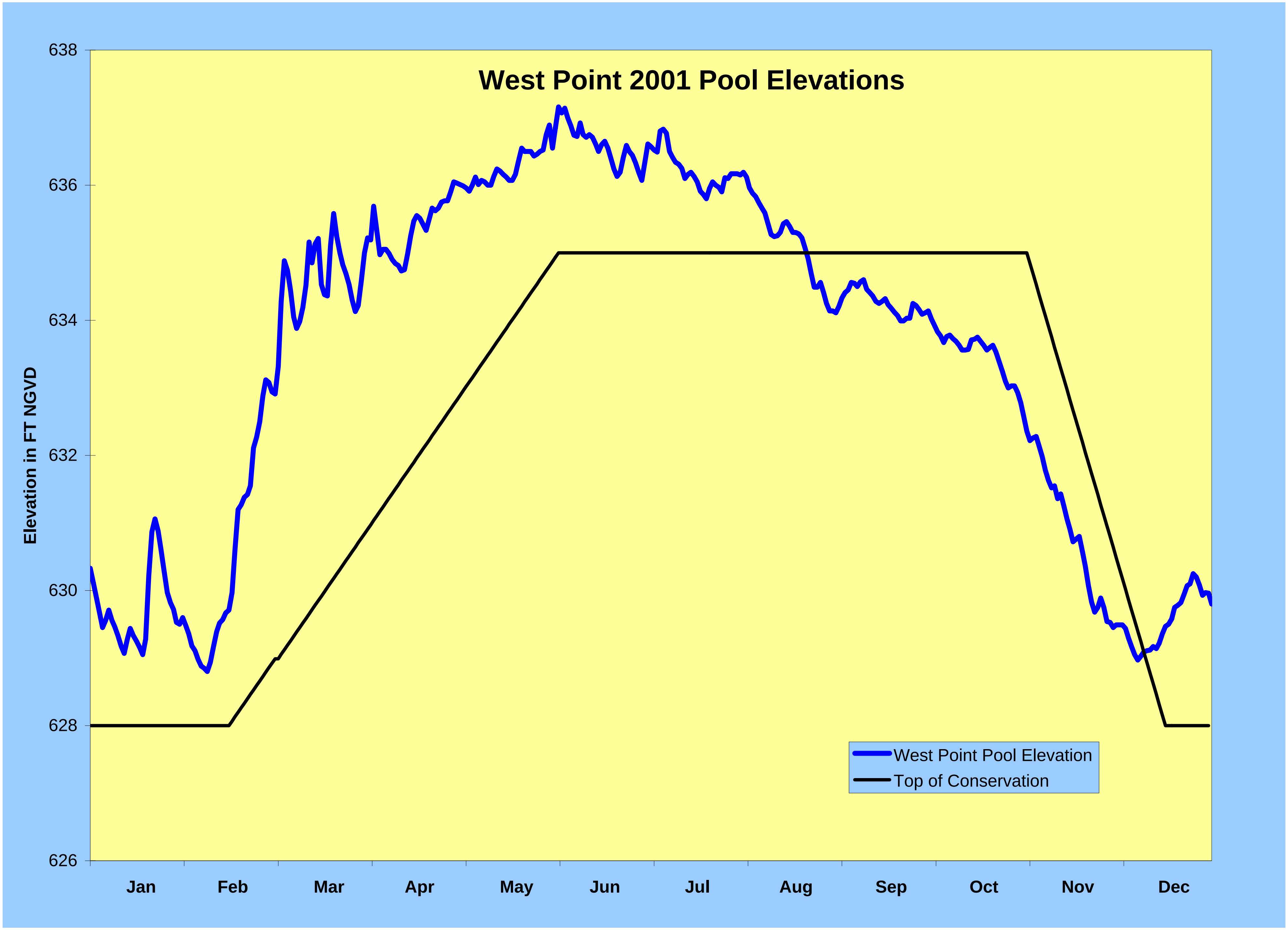

West Point 2000 Pool Elevations
Elevation in FT NGVD
637
636
635
634
633
632
631
630
629
628
627
626
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
West Point Pool Elevation
Top of Conservation



W. F. George 2000 Pool Elevation
191.0
190.0
189.0
188.0
187.0
186.0
185.0
184.0
183.0
Elevation in FT NGVD
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
W. F. George Pool Elevation
Top of Conservation

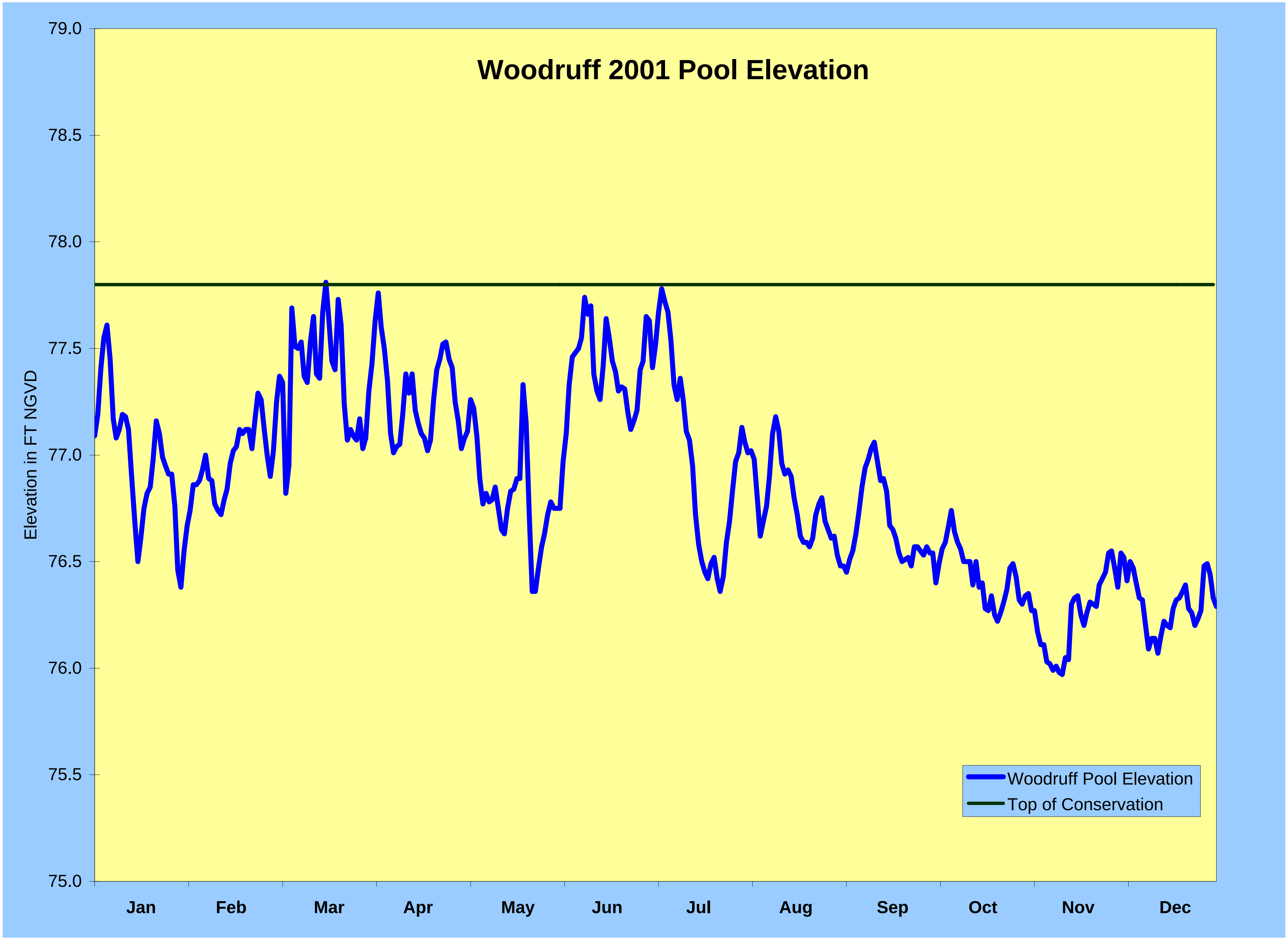

Woodruff 2000 Pool Elevation
Elevation in FT NGVD
79.0
78.5
78.0
77.5
77.0
76.5
76.0
75.5
75.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Woodruff Pool Elevation
Top of Conservation

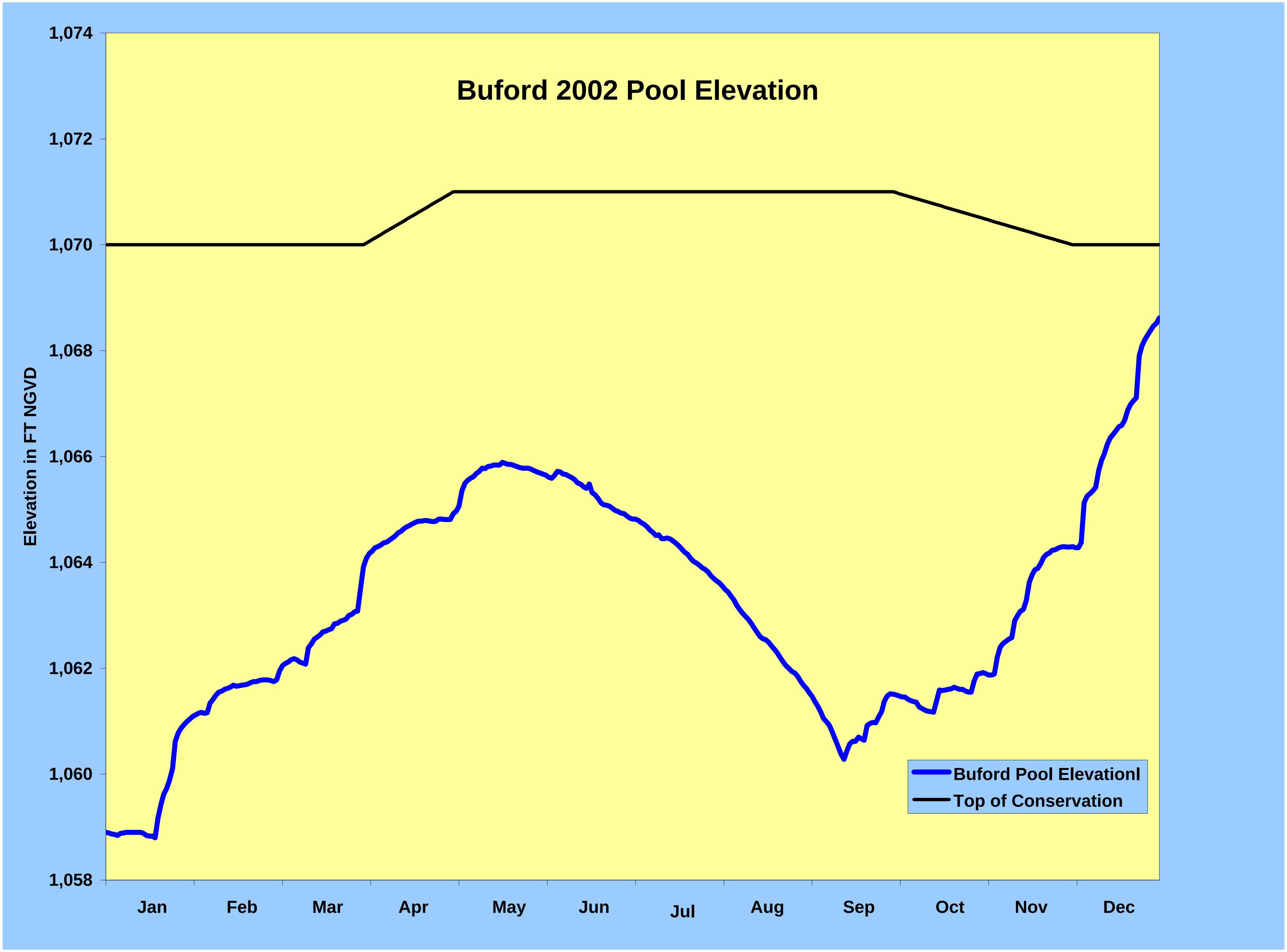

Buford 2001 Pool Elevation
Elevation in FT NGVD
1,074
1,072
1,070
1,068
1,066
1,064
1,062
1,060
1,058
1,056
1,054
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Buford Pool Elevationl
Top of Conservation



West Point 2001 Pool Elevations
Elevation in FT NGVD
638
636
634
632
630
628
626
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
West Point Pool Elevation
Top of Conservation

W. F. George 2001 Pool Elevation
W. F. George Pool Elevation
Top of Conservation
Elevation in FT NGVD
192.0
191.0
190.0
189.0
188.0
187.0
186.0
185.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec


Woodruff 2001 Pool Elevation
Elevation in FT NGVD
79.0
78.5
78.0
77.5
77.0
76.5
76.0
75.5
75.0
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Woodruff Pool Elevation
Top of Conservation



Buford 2002 Pool Elevation
1,074
1,072
1,070
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Elevation in FT NGVD
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Buford Pool Elevationl
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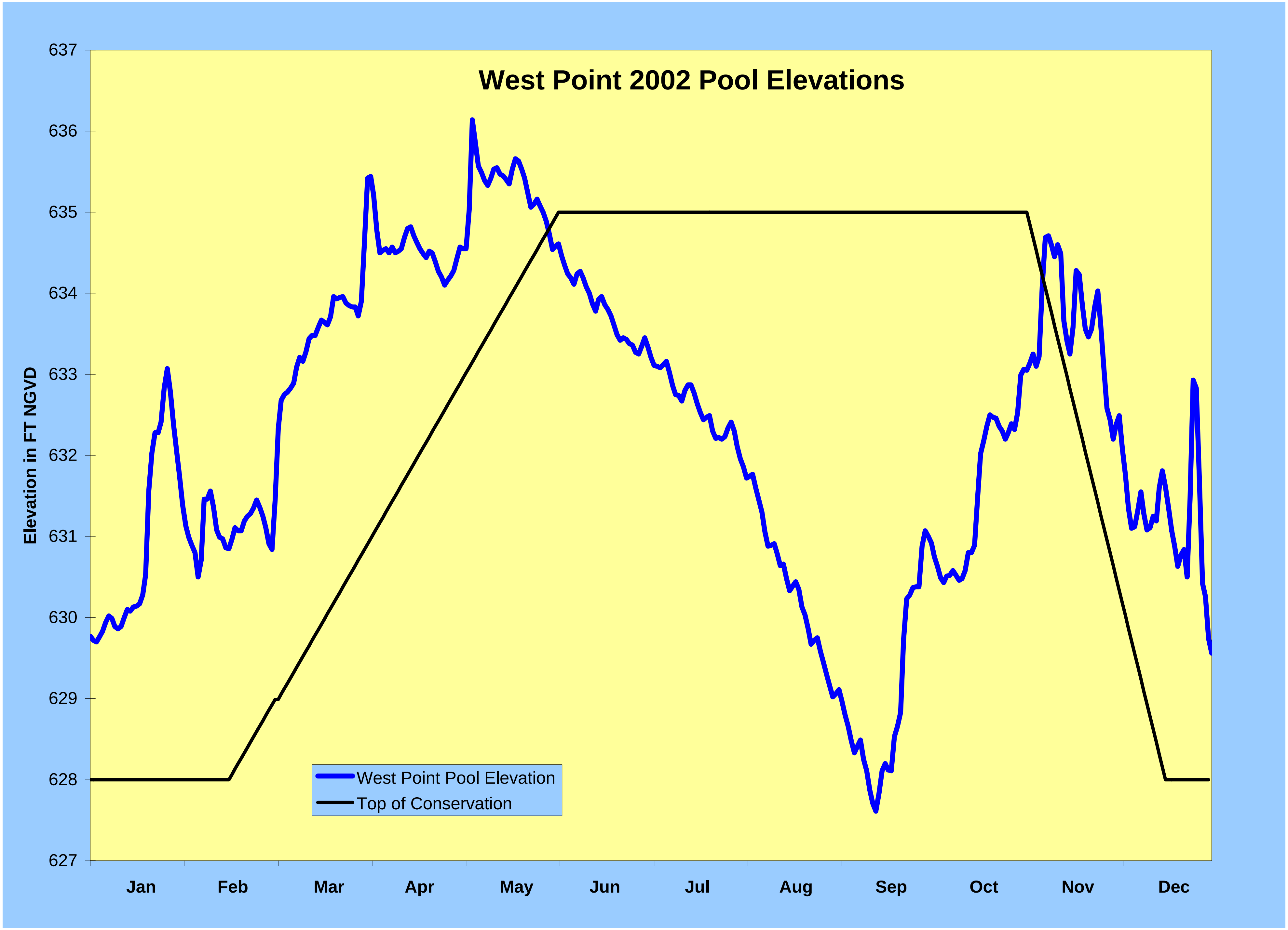

West Point 2002 Pool Elevations
Elevation in FT NGVD
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West Point Pool Elevation
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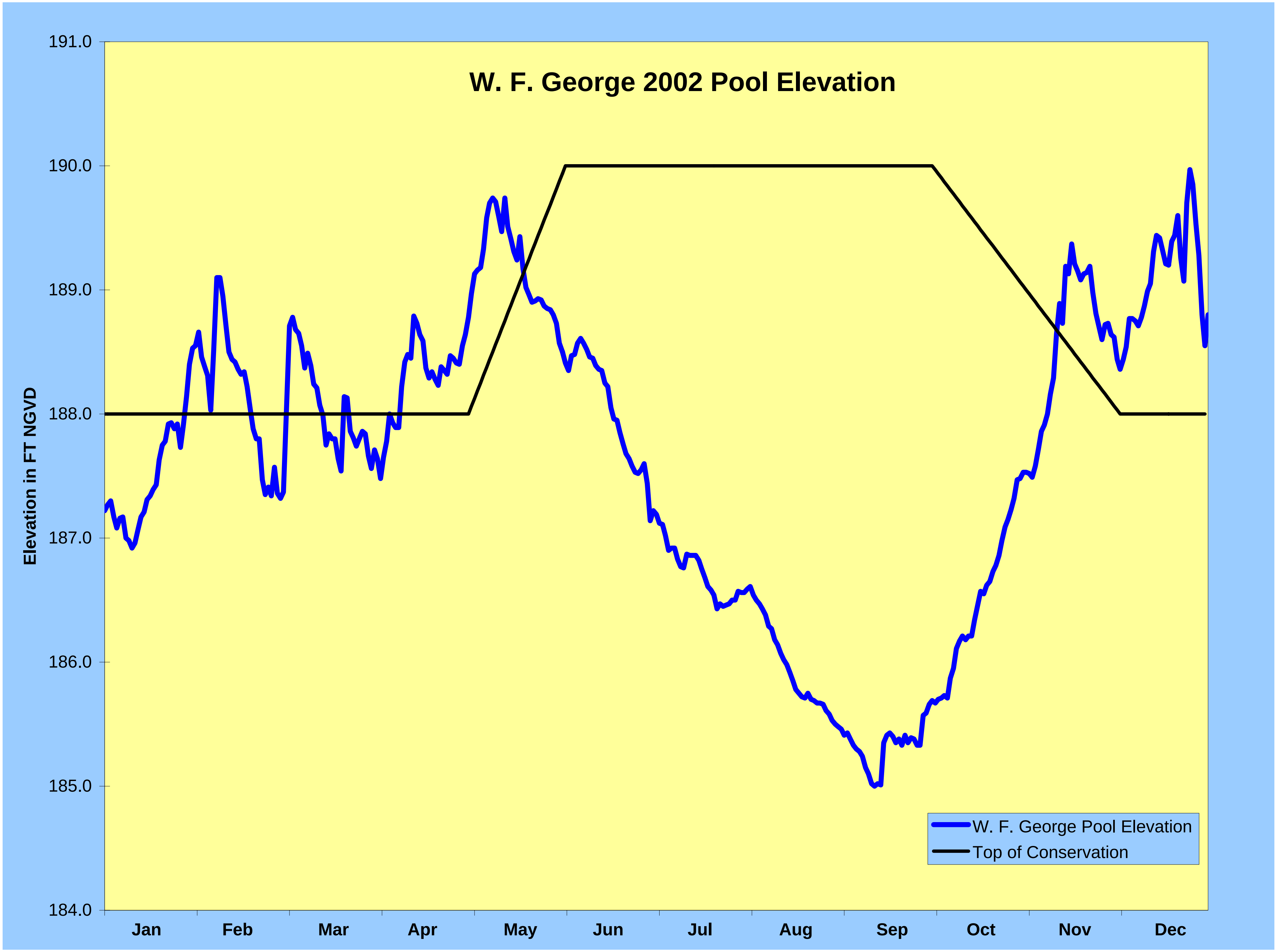
W. F. George 2002 Pool Elevation
Elevation in FT NGVD
191.0
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W. F. George Pool Elevation
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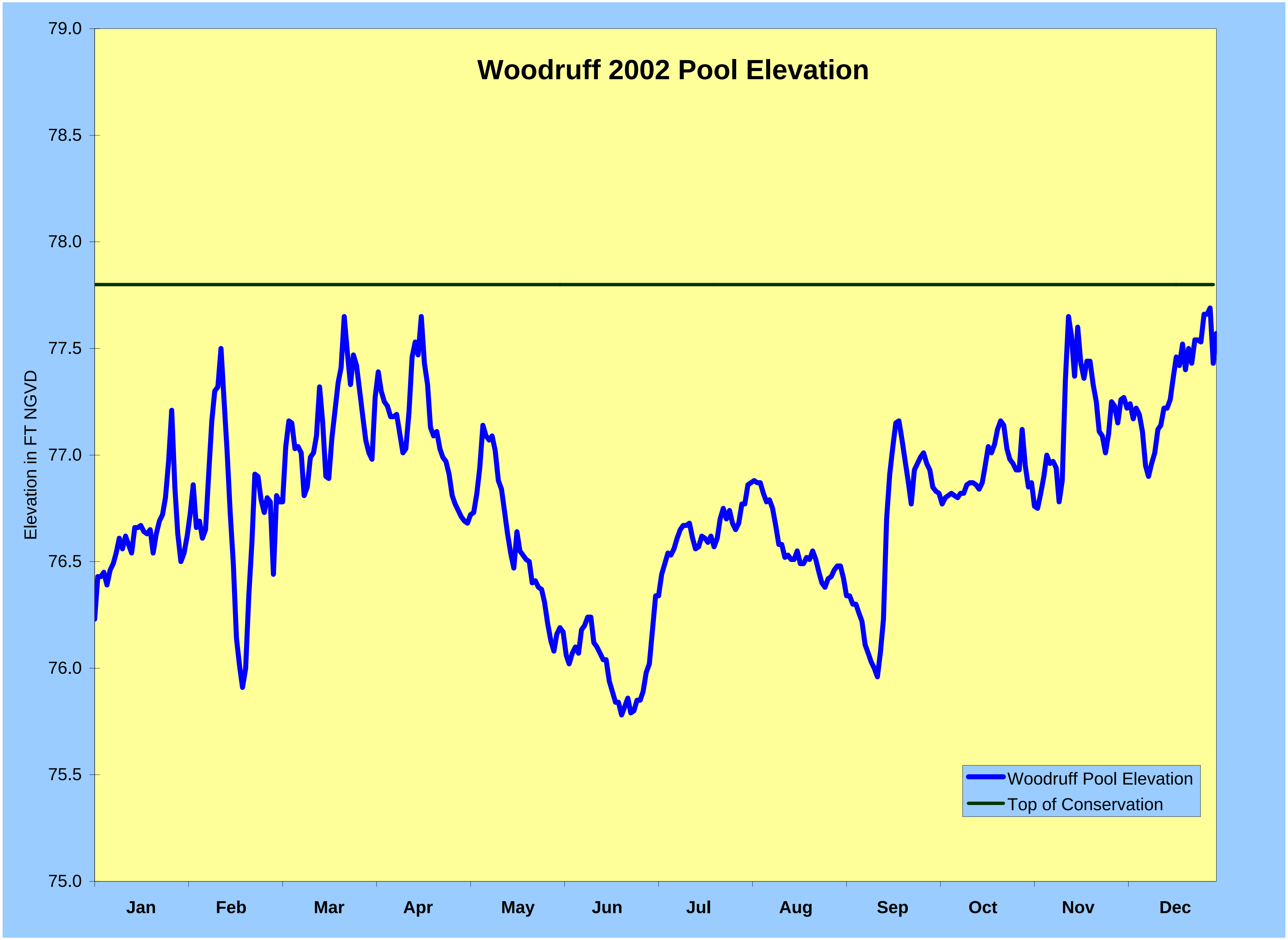

Woodruff 2002 Pool Elevation
Elevation in FT NGVD
79.0
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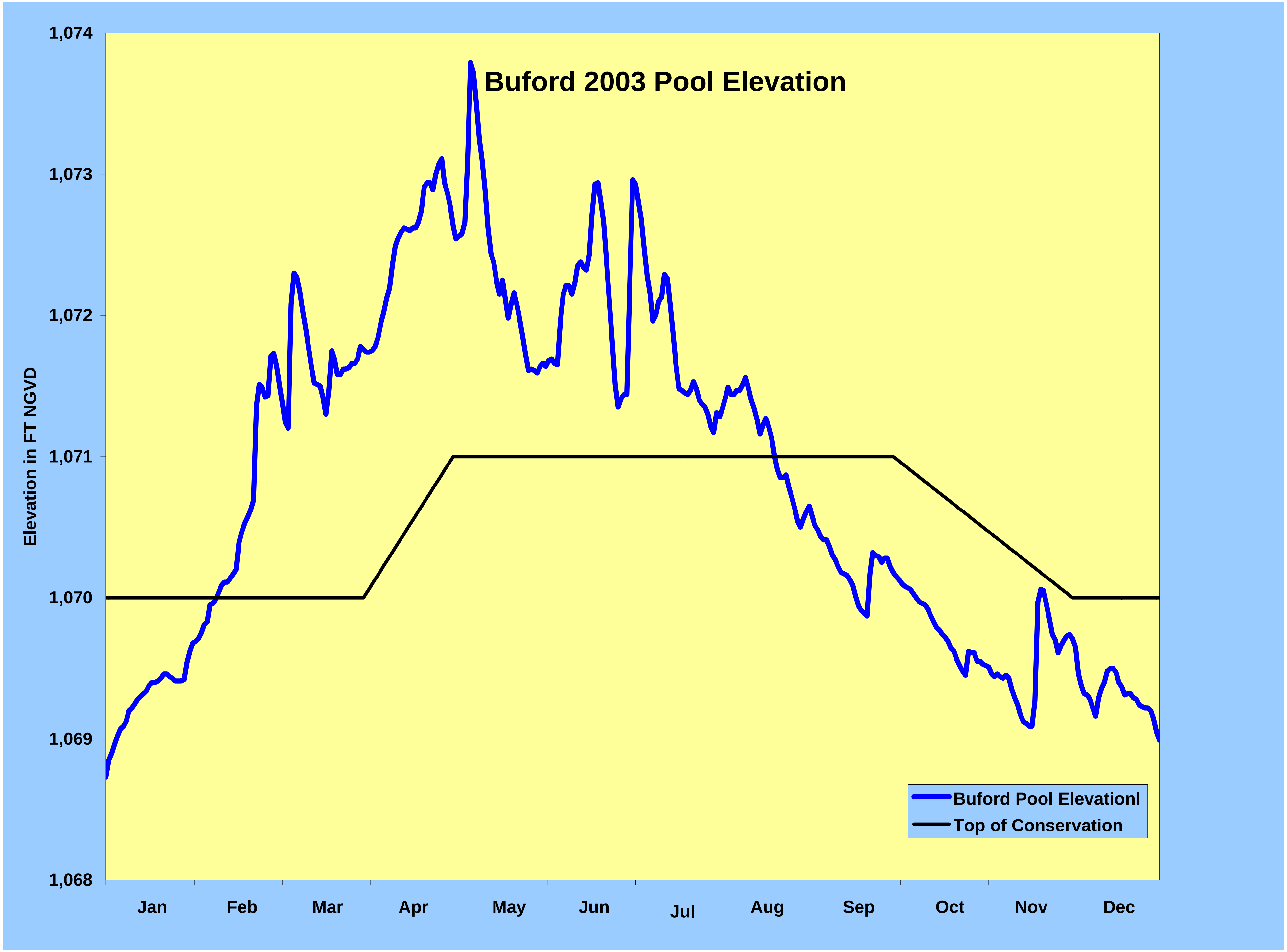
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Elevation in FT NGVD
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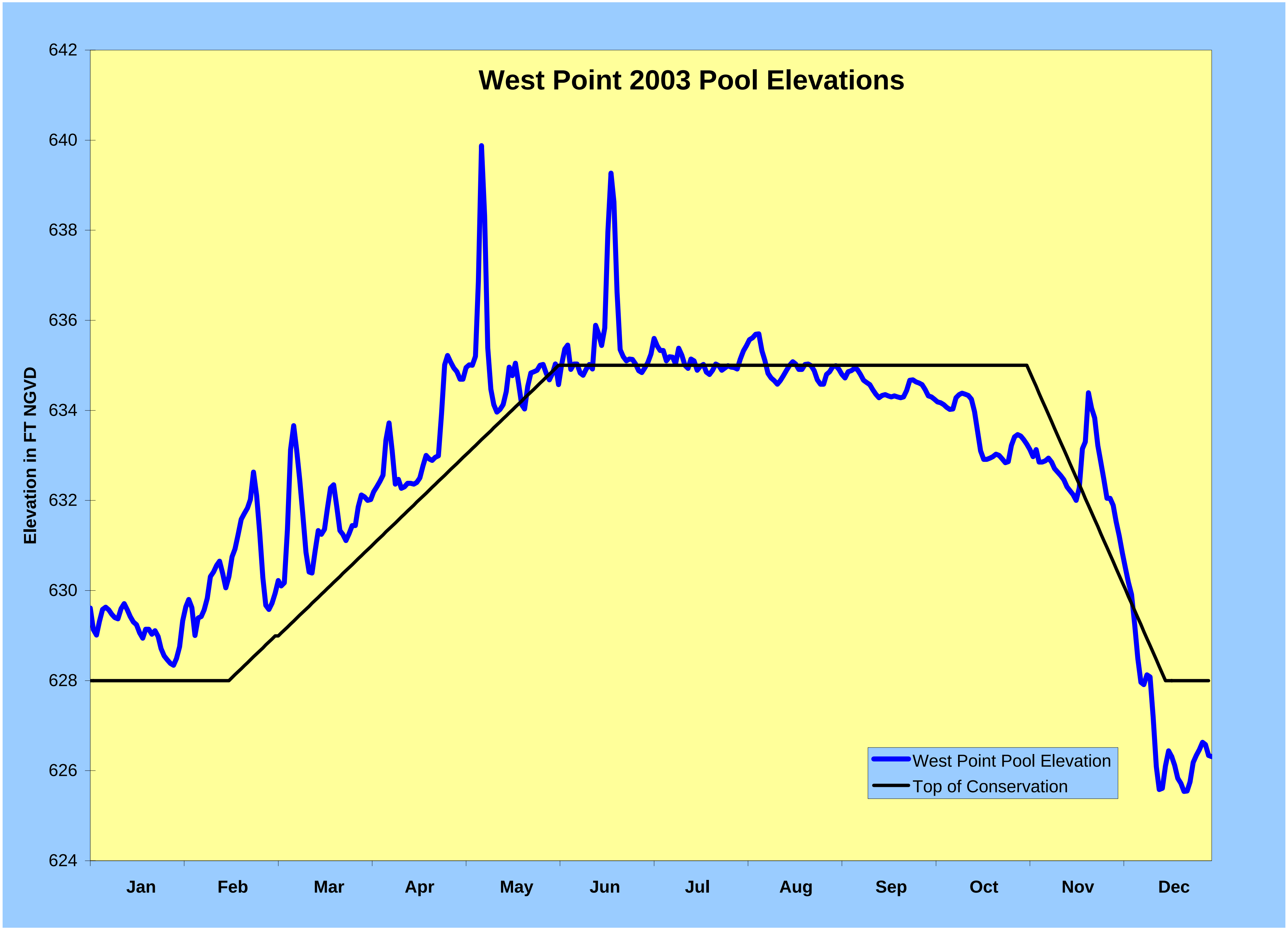

West Point 2003 Pool Elevations
Elevation in FT NGVD
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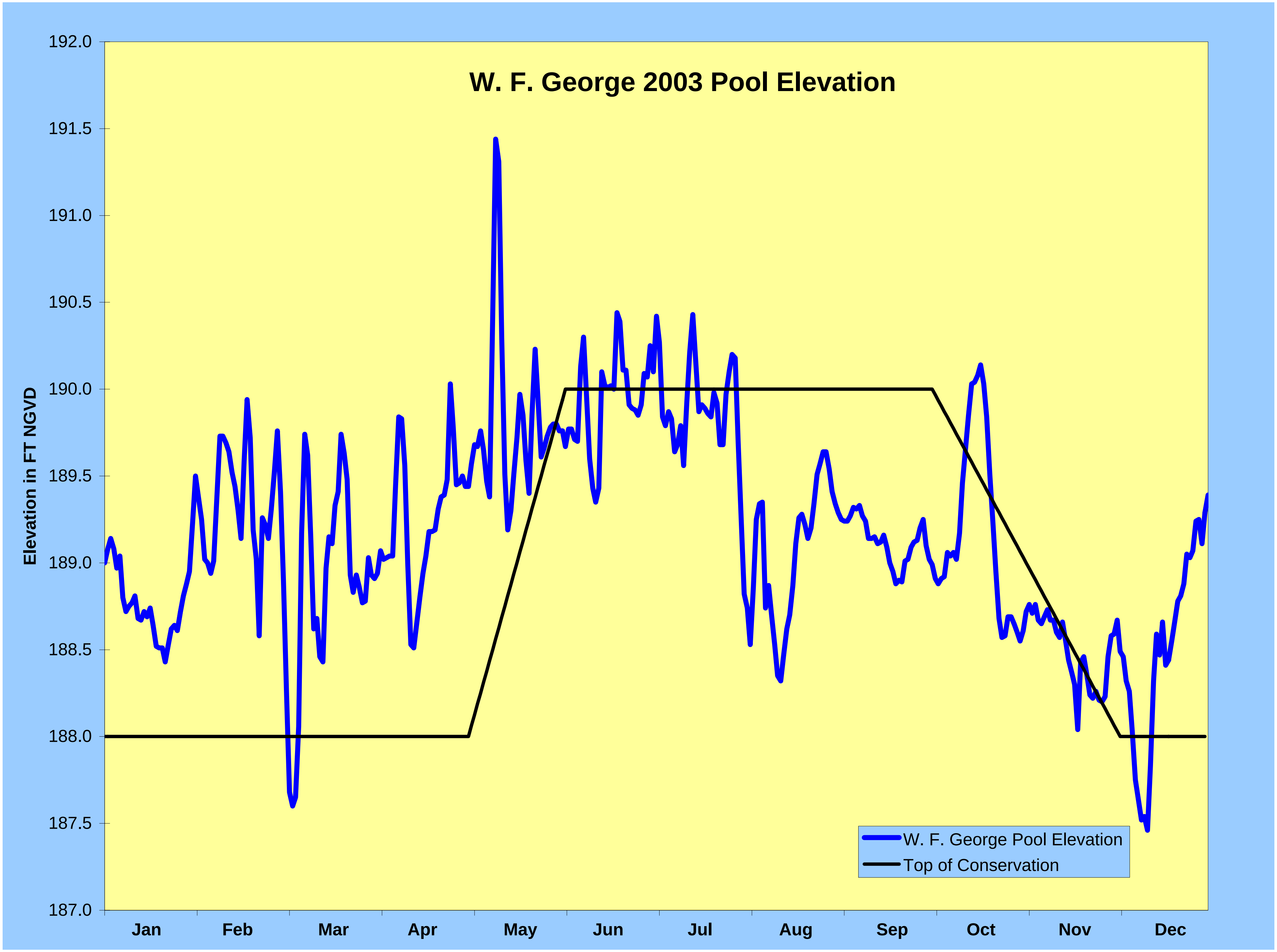
West Point Pool Elevation
Top of Conservation


W. F. George 2003 Pool Elevation
Elevation in FT NGVD
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W. F. George Pool Elevation
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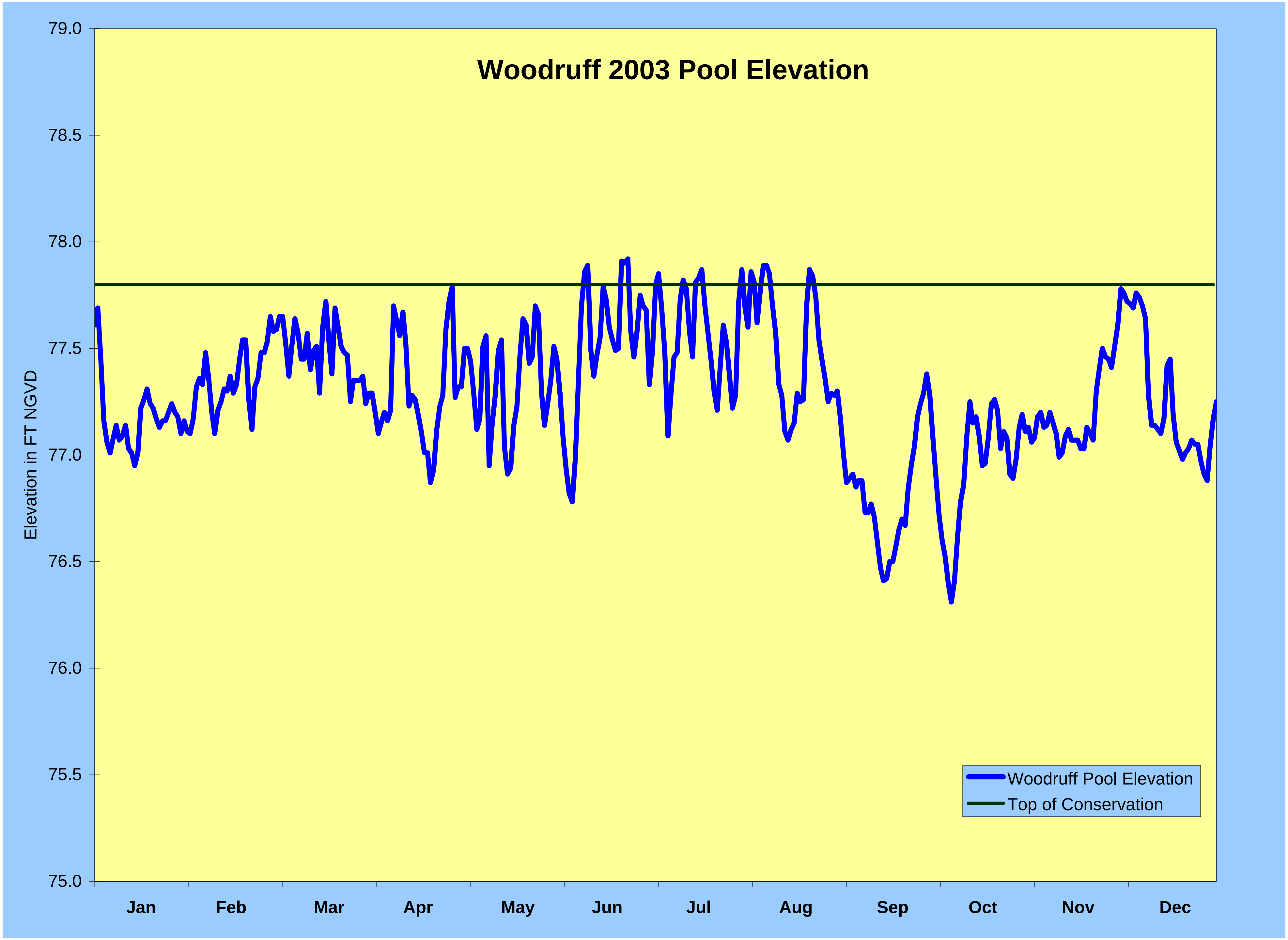
Woodruff 2003 Pool Elevation
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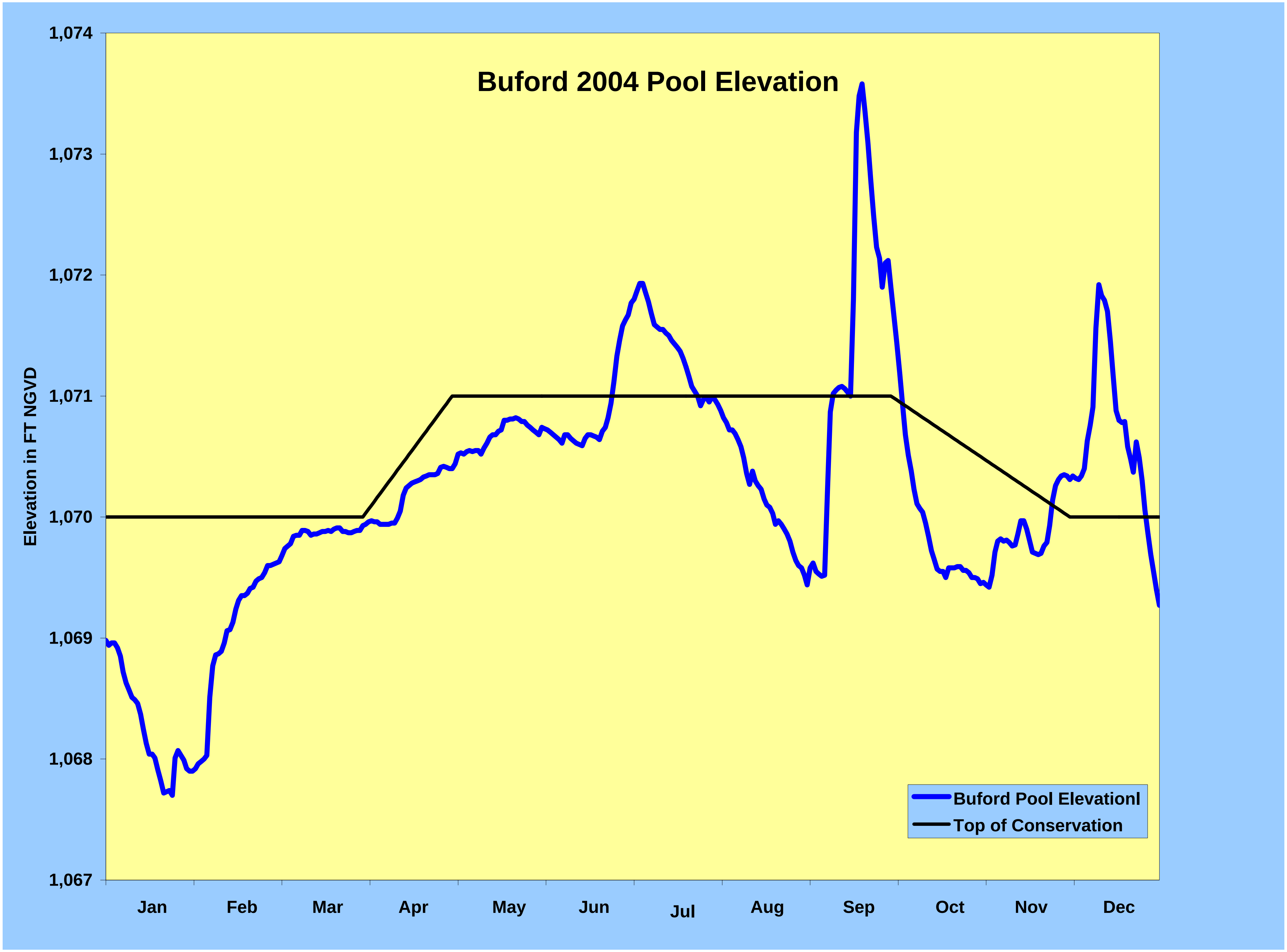

Buford 2004 Pool Elevation
Elevation in FT NGVD
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Buford Pool Elevationl
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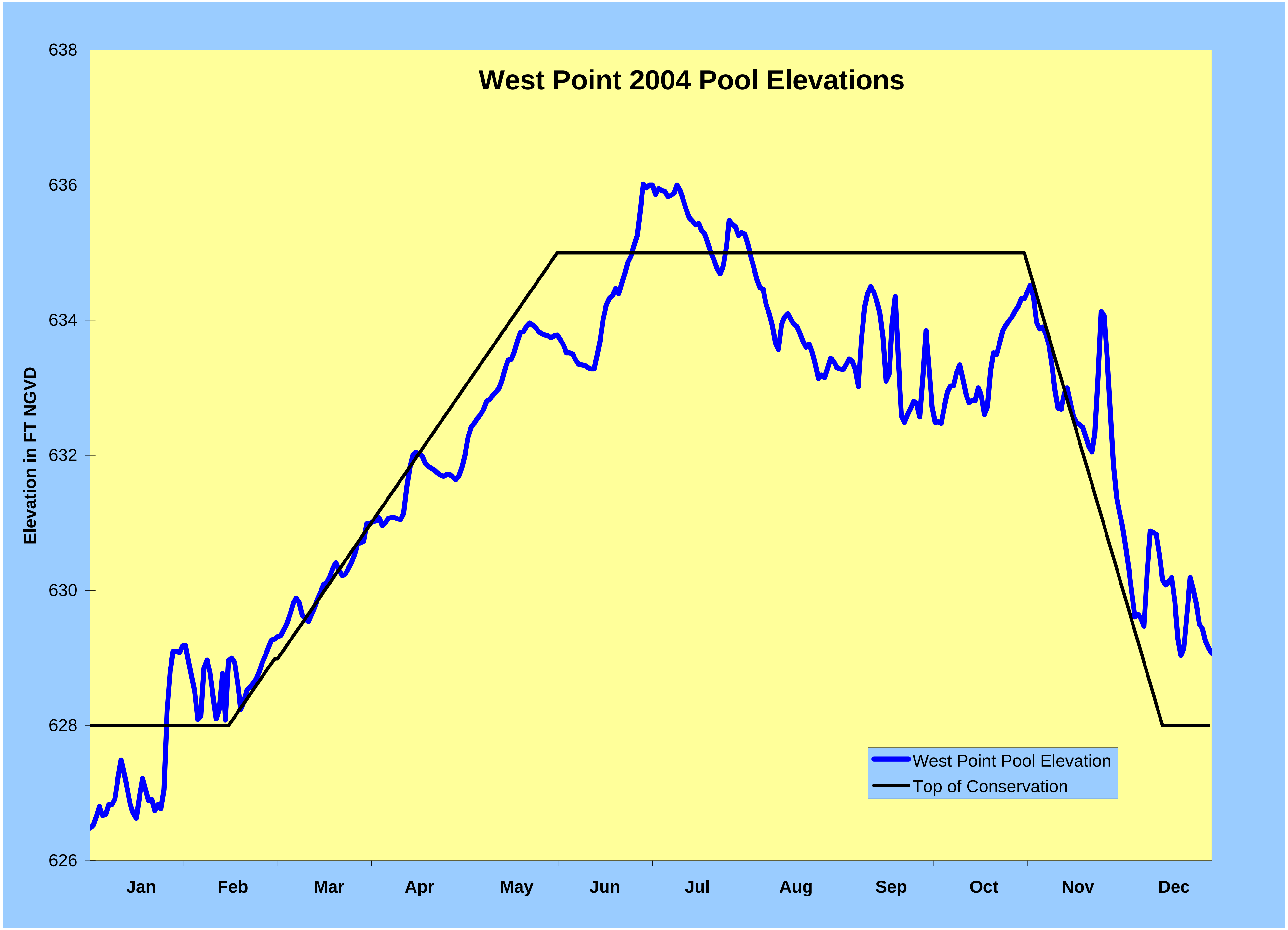

West Point 2004 Pool Elevations
Elevation in FT NGVD
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West Point Pool Elevation
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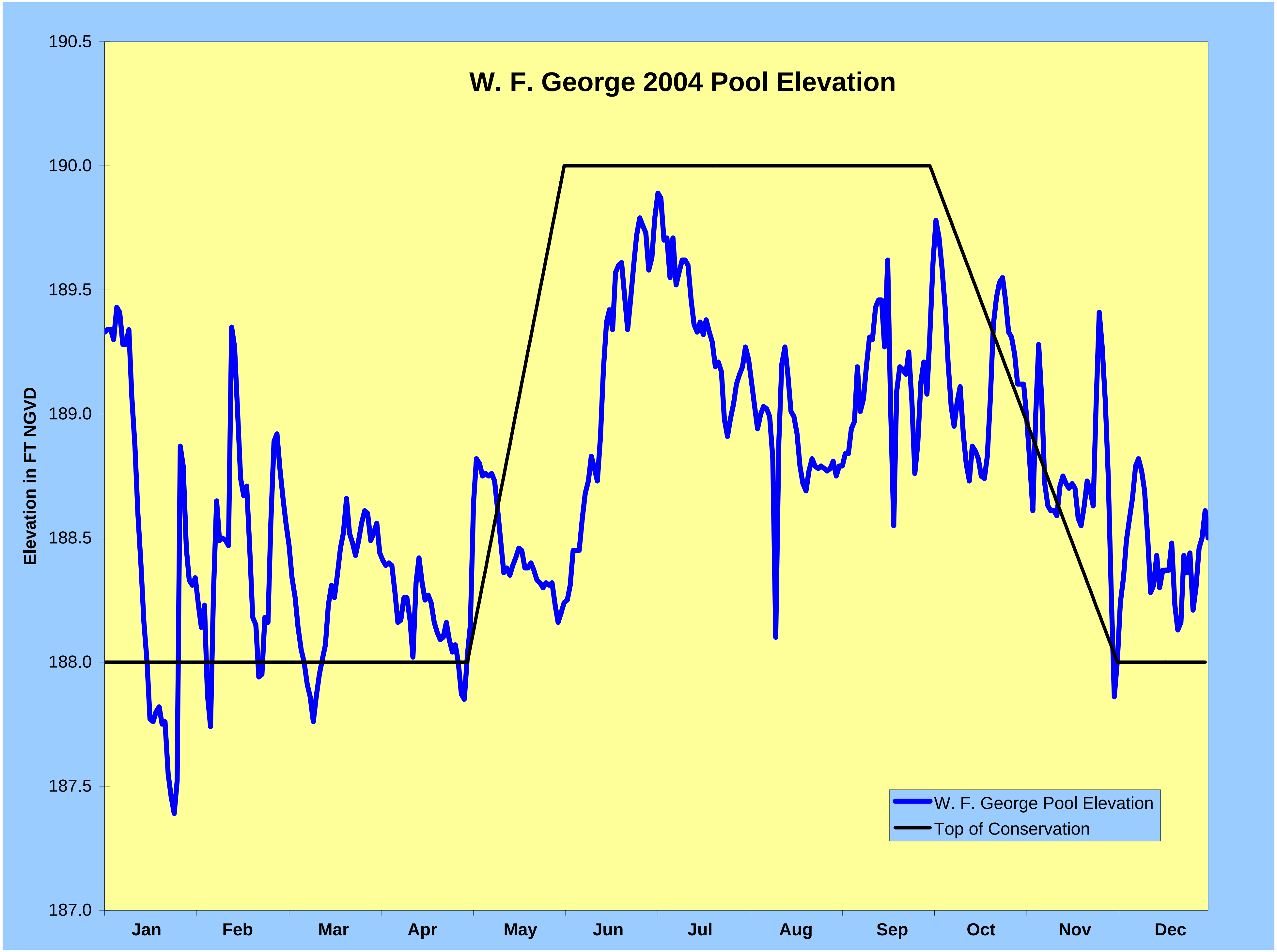
W. F. George 2004 Pool Elevation
Elevation in FT NGVD
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W. F. George Pool Elevation
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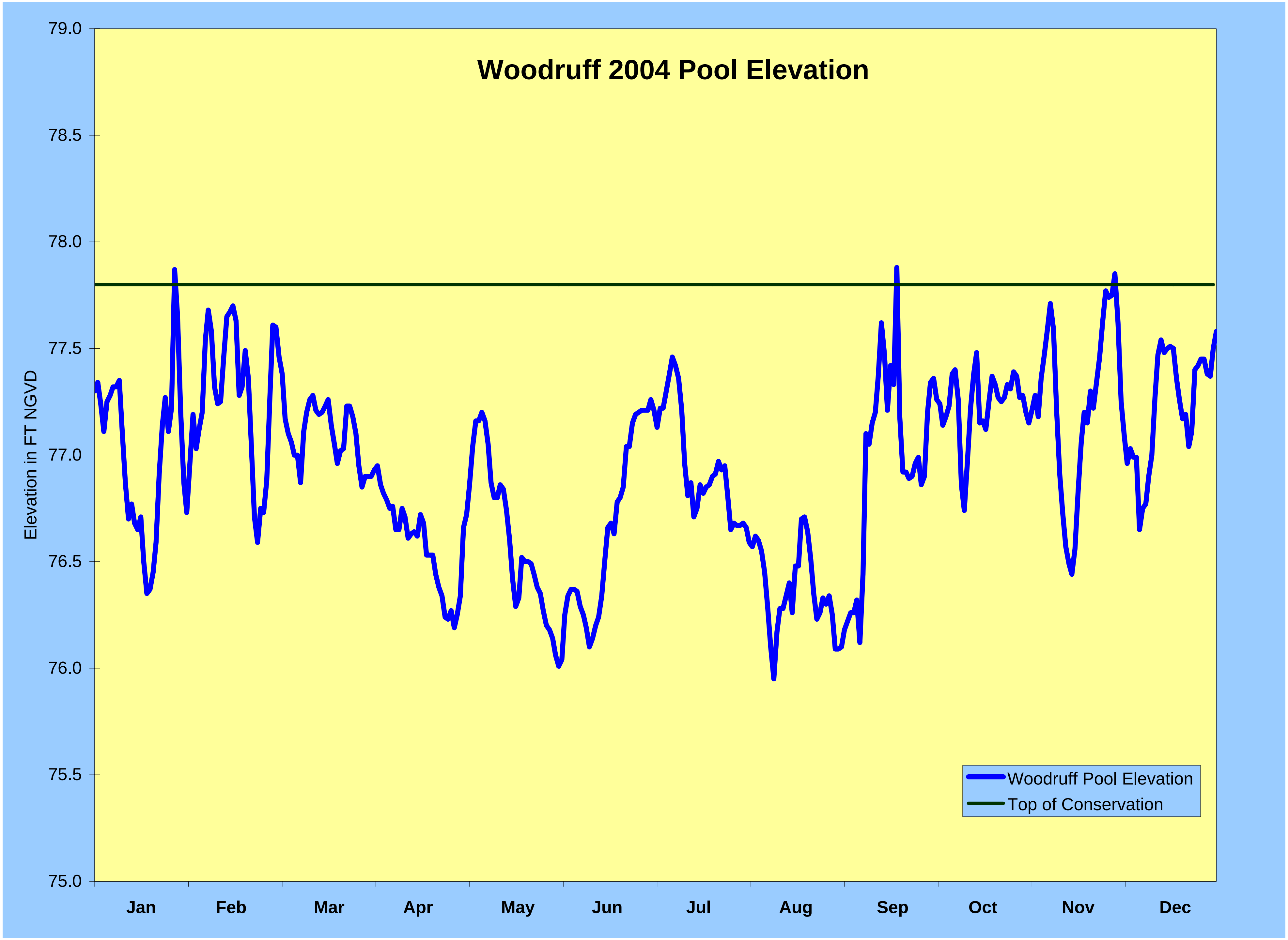
Woodruff 2004 Pool Elevation
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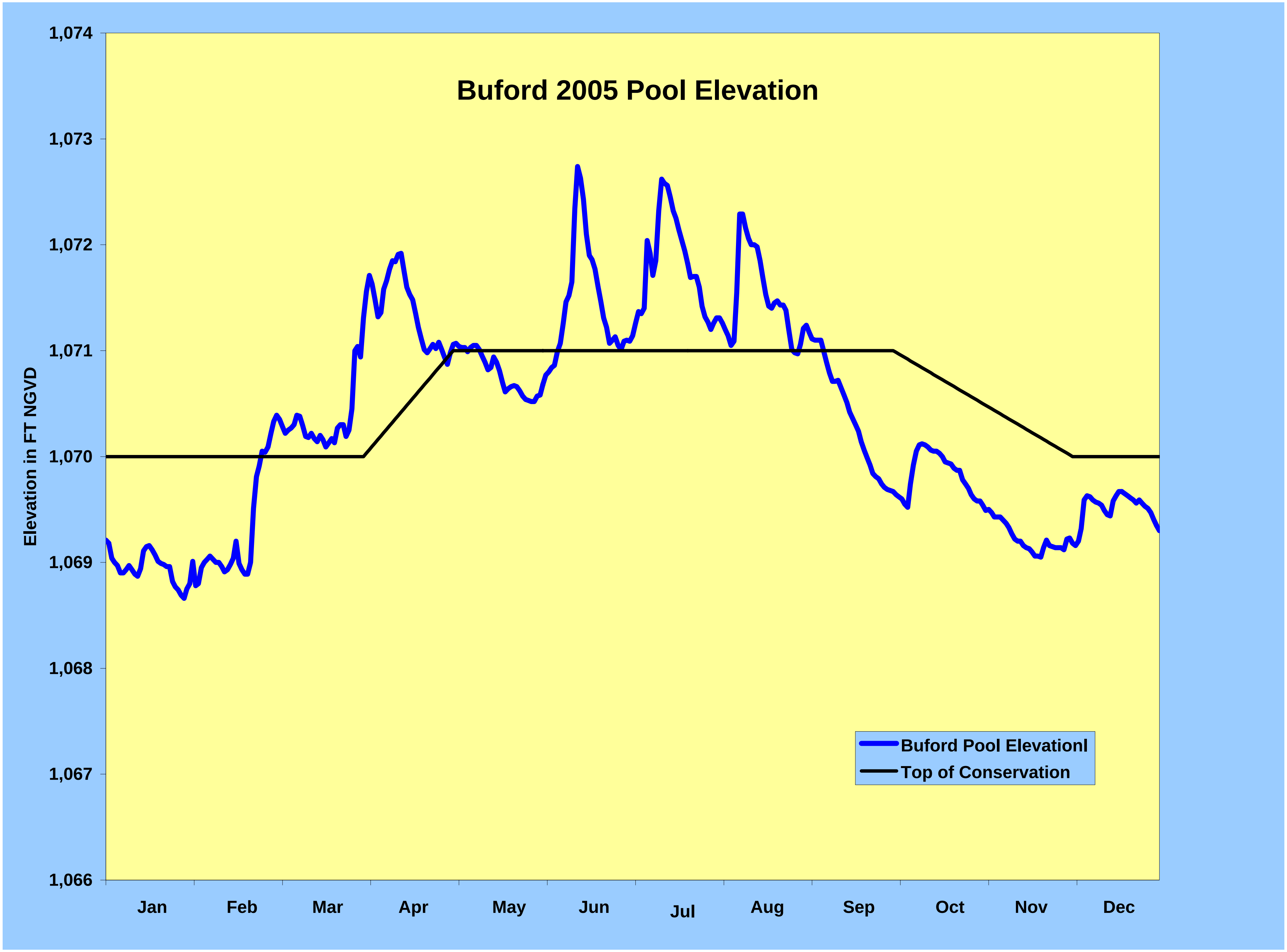

Buford 2005 Pool Elevation
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Buford Pool Elevationl
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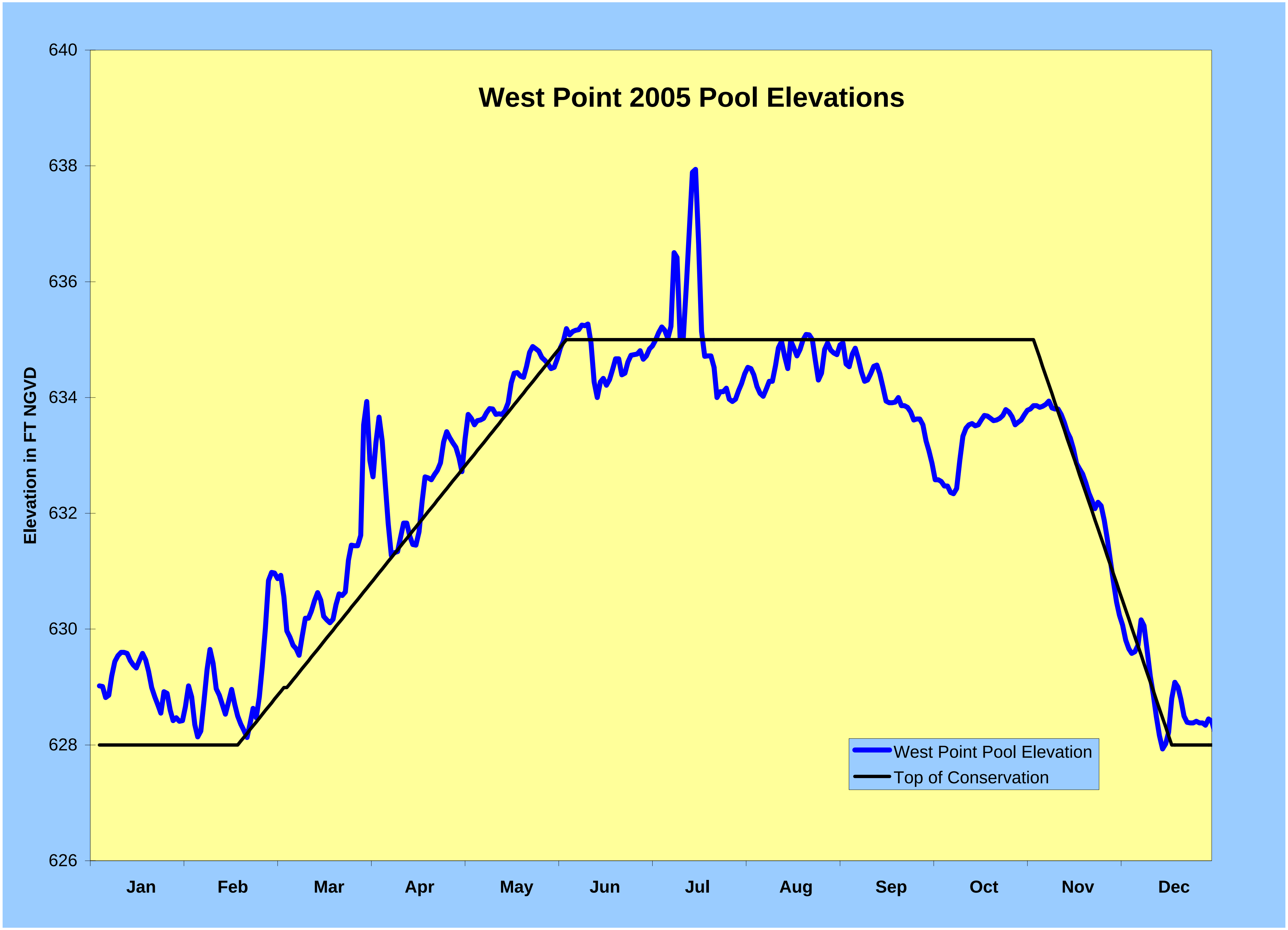
West Point 2005 Pool Elevations
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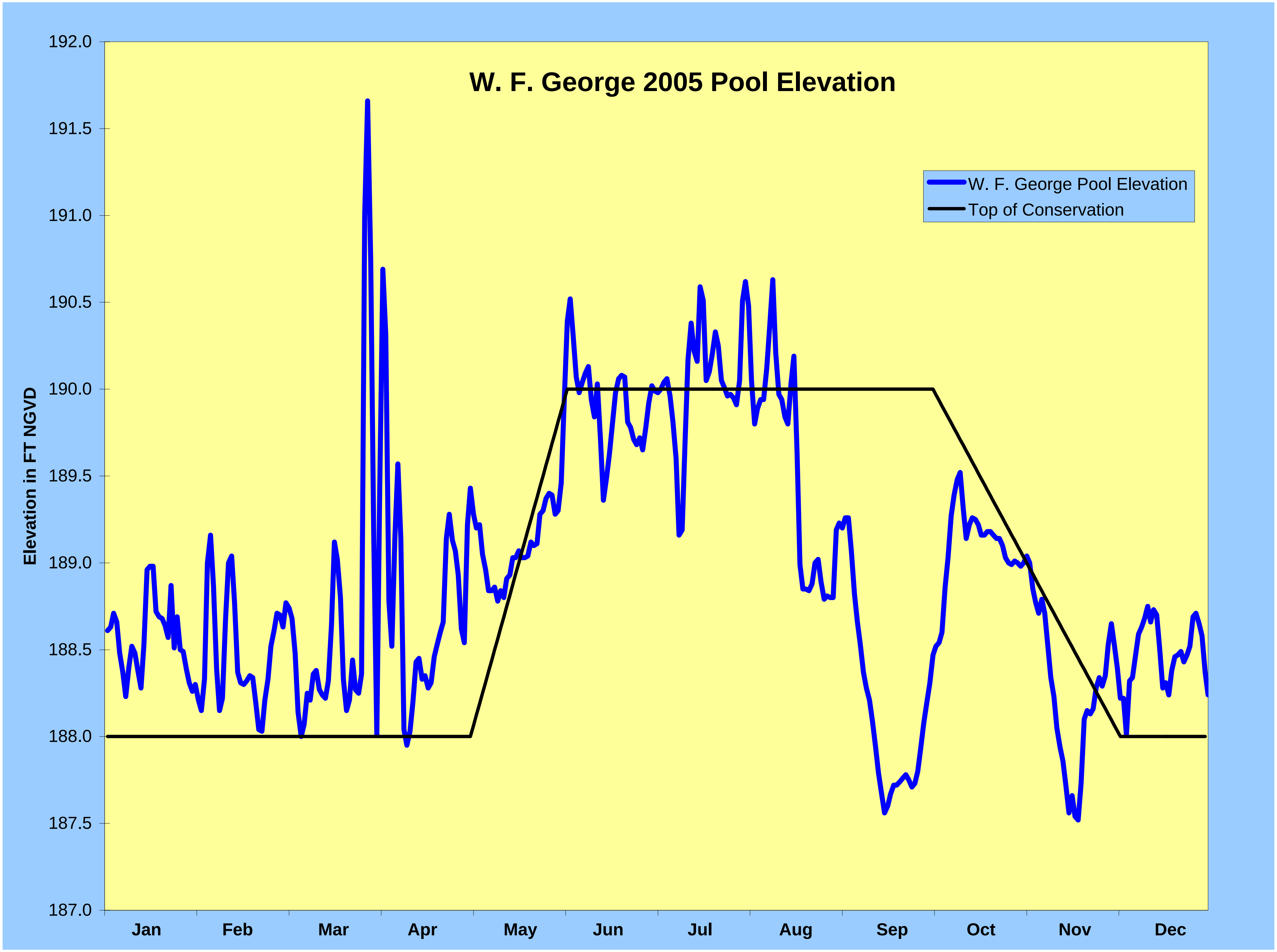

W. F. George 2005 Pool Elevation
W. F. George Pool Elevation
Top of Conservation
Elevation in FT NGVD
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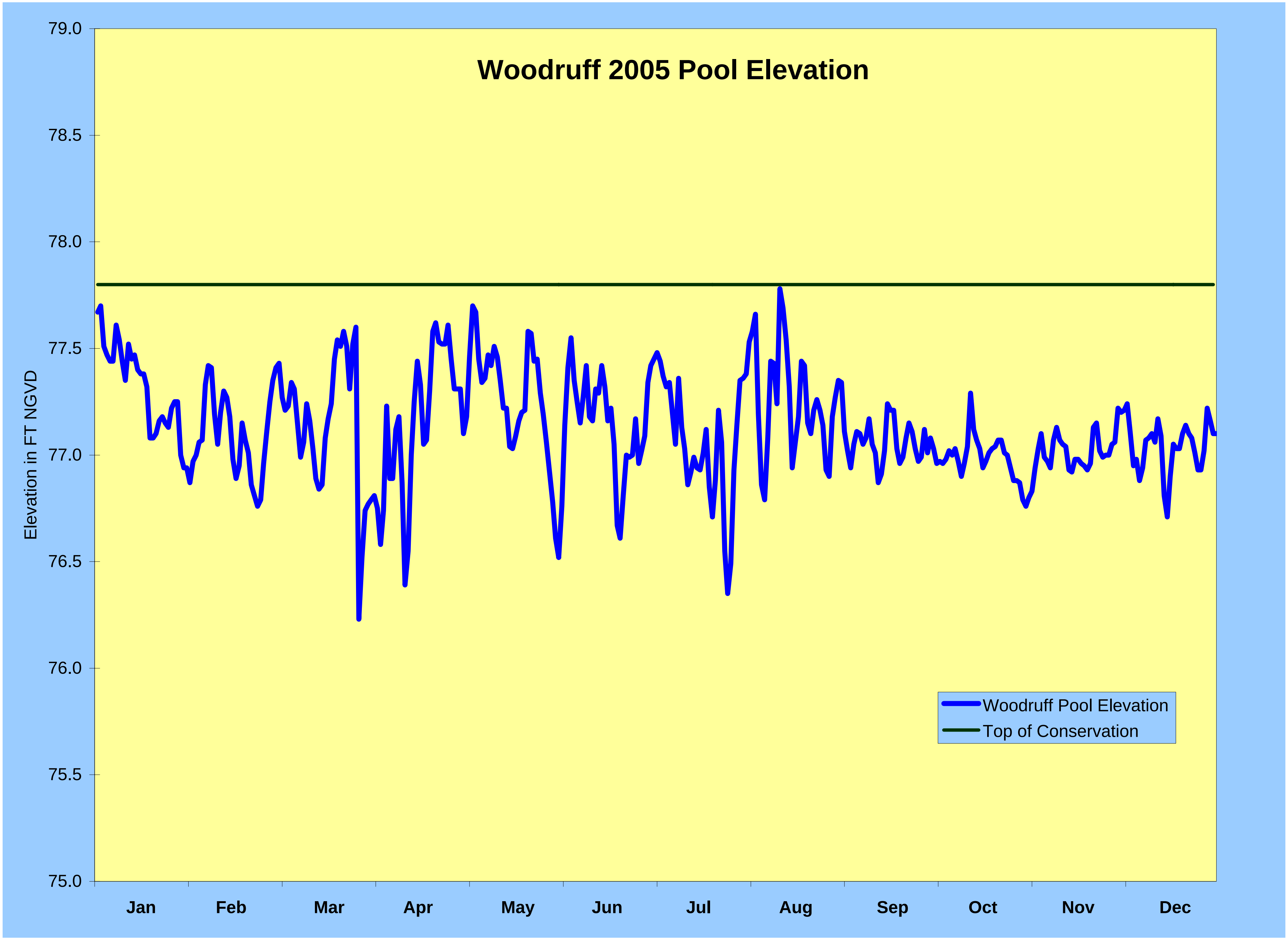
Woodruff 2005 Pool Elevation
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Woodruff Pool Elevation
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Enclosure 35

Monthly Flows at Chattahoochee Gage, 1929 - 2004

	January	February	March	April	May	June	July	August	September	October	November	December	Totals
Average	27213	33238	40638	34143	21680	16637	17316	15115	12327	12416	13343	20083	
Minimum	5980	8280	8260	7010	5210	4540	4530	4430	4530	5010	3900	5150	
Maximum	165000	127000	291000	158000	126000	71300	203000	60800	65900	86800	102000	137000	
99.9% exceedence	6163	8378	8298	7082	5404	4580	4578	4498	4671	5080	4160	5393	
99% exceedence	6785	8980	11386	9661	6939	5076	5367	4689	5461	5290	5280	6252	
95% exceedence	9700	11600	13600	12200	8883	7470	7205	5953	6120	5690	5730	7350	
90% exceedence	11600	13700	16500	14400	10400	8660	8620	7900	6910	6307	6460	8800	
80% exceedence	13600	17800	20300	17700	12600	10500	10100	9542	8480	7604	8110	9952	
75% exceedence	15000	19700	22000	18700	13400	11500	11000	10500	9000	8300	8688	10700	
50% exceedence	22200	28400	33400	27800	18000	14600	14000	13500	11350	10800	11200	14900	
25% exceedence	34275	43575	50400	41300	25100	19300	18900	17400	14000	13500	15200	23900	
10% exceedence	51300	58390	69900	64400	37280	27200	26800	24240	18500	19300	21400	40330	
1% exceedence	78532	94219	160280	124000	72914	47682	79328	43428	31800	44847	44744	73856	

			MARCH DAYS	%	APRIL DAYS	%	MAY DAYS	%								
Less than 4000	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	3	0	
Less than 5000	0	0	0	0%	0	0%	0	0%	23	11	33	6	0	7	0	80
Less than 14000	527	240	134	6%	201	9%	668	28%	1013	1188	1301	1731	1895	1651	1077	11626
Less than 14970	600	304	184	8%	257	11%	791	33%	1207	1326	1496	1851	1978	1740	1214	12949
Less than 16000	684	347	210	9%	315	14%	899	38%	1353	1488	1648	1943	2043	1807	1330	14068
Less than 17000	790	387	259	11%	400	17%	1034	43%	1472	1603	1756	1999	2091	1893	1421	15106
Less than 18000	894	450	310	13%	491	21%	1188	50%	1599	1705	1833	2041	2133	1948	1499	16092
Less than 21000	1137	645	533	22%	778	34%	1529	64%	1865	1939	2029	2173	2225	2086	1676	18616
Total Days	2418	2182	2387		2310		2387		2310	2387	2387	2310	2418	2340	2418	

Volatility	
1928-1952 Average Day	1515.544264
1953-2006 Average Day	1923.89668

D-2 USFWS letter to CESAM, dated 9 March 2006, Acknowledgement of Initiation of Formal Section 7 Consultation

IN REPLY REFER TO:

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

March 9, 2006

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

Re: Jim Woodruff Dam Interim Operations
Calhoun, Franklin, Gadsden, Gulf, Jackson, and Liberty counties, FL
FWS Log No. 4-P-06-138

Dear Mr. Flakes:

The Service acknowledges receipt on March 8, 2006, of your letter dated March 7, 2006, requesting initiation of formal consultation under section 7 of the Endangered Species Act (ESA). This consultation concerns the effects of the Corps' proposed interim operations of Jim Woodruff Dam (the proposed action) on the Gulf sturgeon and its designated critical habitat, and on two freshwater mussels, the fat threeridge and purple bankclimber. Jim Woodruff Dam is the downstream-most project in the Corps' system of dams and reservoirs in the Apalachicola-Chattahoochee-Flint (ACF) River Basin, and is the upstream limit of the range of the three listed species and of designated critical habitat in the Apalachicola River. The proposed action is a set of interim operations for the Corps' ACF reservoir projects as a system, not at each project separately, expressed in terms of year-round releases from Jim Woodruff Dam. The term "interim" recognizes that the Corps anticipates updating its Water Control Plan for the ACF projects, at which time we would again consult with you.

All information required of you to initiate consultation was either included with your letter or is otherwise available to the Service. Section 7 allows the Service up to 90 calendar days after receipt of a complete initiation request to conclude formal consultation with your agency and an additional 45 calendar days to prepare our biological opinion. If necessary, the Corps and the Service may extend this time frame by mutual agreement; otherwise, we expect to provide you with our biological opinion no later than July 21, 2006.

During formal consultation, the Service shall: 1) review all information relevant to the proposed action and the listed species; 2) evaluate the current status of the listed species and designated critical habitat; 3) evaluate the effects of the proposed action and cumulative effects on the listed species and designated critical habitat; 4) formulate a biological opinion as to whether the proposed action, taken together with cumulative effects, is likely to jeopardize the continued existence of the listed species or adversely modify designated critical habitat; 5) discuss with the Corps the basis for any finding in the biological opinion and, if necessary, work with you to identify reasonable and prudent alternatives that would avoid jeopardy or adverse modification; 6) formulate discretionary conservation recommendations that will assist the Corps in reducing or eliminating impacts to listed species and designated critical habitat; 7) formulate a statement concerning incidental take, if such take may occur; and 8) use the best scientific and commercial data available, and give appropriate consideration to any beneficial actions taken by the Corps, including actions taken before consultation was initiated. If jeopardy or adverse modification is not likely, but the proposed action may take listed species incidental to otherwise lawful activity, we will work with you to identify reasonable and prudent measures that minimize the amount or extent of such take.

Your letter also requests Service concurrence with a determination that the Corps' water management operations at Jim Woodruff Dam, and the associated releases to the Apalachicola River, are not likely to jeopardize the continued existence of federally listed species or result in the adverse modification of designated critical habitat. The Service makes jeopardy and adverse modification determinations for listed species and designated critical habitats only within a biological opinion. As described above, the Service will formulate a biological opinion for the proposed action no later than July 21, 2006, unless our agencies agree to an extension.

It is the responsibility of the federal action agency to make jeopardy and adverse modification determinations only in the case of species that are proposed for listing and areas that are proposed for designation as critical habitat, respectively (section 7(a)(4) of the ESA). The Service is presently considering whether it is prudent to designate critical habitat for seven freshwater mussels, including the two listed mussels that are named in this consultation. Under a settlement agreement stemming from a lawsuit filed in the U.S. District Court for the Northern District of Georgia (Civil Action No. 1:04 CV-0729-GET), the Service shall publish in the Federal Register on or before May 30, 2006, a prudency determination regarding critical habitat for the seven mussels, and if prudent, a proposed rule designating critical habitat. We cannot at this time announce or presume the outcome of that process; however, should we propose critical habitat that is within the area affected by the proposed action of this consultation, the conference provisions of section 7(a)(4) would then apply to this action. If so, we will work with you at that time to determine how we may best comply with our additional section 7 responsibilities in concert with this consultation.

As a reminder, the ESA requires that after initiation of formal consultation, the Federal action agency may not make any irreversible or irretrievable commitment of resources that limits future options. This practice insures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of listed species or adversely modifying designated critical habitat.

The Service appreciates the Corps' cooperation in defining ACF project operations that avoid or minimize impacts to the listed species and designated critical habitat. The proposed action represents a substantial and meaningful step towards operations that contribute to conservation of the species. We look forward to working with you further in the coming weeks

Sincerely yours,

Gail A. Carmody
Field Supervisor

JZ/receipt of formal cons req.doc

D-3 Memorandum for Record of 25 April 2006 Telecon with USFWS regarding possible adjustments to IOP

CESAM-PD-EI 26 April 2006

MEMORANDUM FOR RECORD

SUBJECT: Jim Woodruff Dam Existing Water Management Operations Section 7 Consultation – Teleconference with U.S. Fish and Wildlife Service on Elements of the Interim Operations Plan

1. A teleconference was held on 25 April 2006 between the U.S. Army Corps of Engineers, Mobile District and U.S. Fish and Wildlife Service (USFWS) to discuss the status of water management operations to implement the Interim Operations Plan, as proposed in the request to initiate formal Section 7 consultation. The intent was to share with USFWS the "lessons learned" to date in attempts to meet the conditions specified in the Interim Operations Plan, to clarify requirements and/or intent of the elements of the Interim Operations Plan, and to assure that there was a common understanding of the definition of and measurement of basin inflows and ramping rates upon which the Interim Operations Plan is based. The Mobile District, also wanted to offer some suggestions for possible adjustments to operations or to consider possible alternative operations methods or measurement tools that would make the Interim Operations Plan more manageable from a project operations perspective while still meeting the needs of the federally-protected species. The following representatives from Mobile District and USFWS participated in the teleconference and discussions.

Jerry Ziewitz	USFWS, Panama City, FL Field Office

OPERATIONS DIVISION REPRESENTATIVES:

Jim Walker	Asst. Chief, Operations Division
Leon Cromartie	Chief, Hydropower Section
Jerry Fulton	Natural Resources Section
Bill Smallwood	Operations Project Manager, ACF Project Office
Richard Johns	Jim Woodruff Dam Powerhouse
Bob Chitwood	Walter F. George Resource Management Office
Bo Ansley	Lake Seminole Resource Management Office
Bill Bond	Lake Seminole Resource Management Office

ENGINEERING DIVISION REPRESENTATIVES:

Memphis Vaughan	Chief, Water Management Section
Cheryl Hrabovsky	ACF Water Manager

PLANNING DIVISION REPRESENTATIVES:

Mike Eubanks	Team Leader, Inland Environment Team
Joanne Brandt	ACF Compliance Manager, Inland Environment Team
Matt Lang	Inland Environment Team

2. Status of Gulf Sturgeon Spawning and Effectiveness of the Interim Operations. Jerry Ziewitz gave a current status of the progress of Gulf sturgeon spawning below Jim Woodruff Dam. Sturgeon eggs have been collected from three spawning locations this year: the previously known spawning site at approximate NM 105 immediately below Jim Woodruff Dam; a second site located on the left descending bank just downstream of the I-10 Hwy bridge; and a third site identified earlier this week on the right descending bank immediately upstream of the I-10 Hwy bridge. Although eggs were collected this week, water temperatures have risen to about 24 degrees centigrade, and spawning activities are expected to be concluding shortly due to the rising water temperatures. Jerry Z. had reviewed the web postings of basin inflows, discharges from Jim Woodruff Dam to the Apalachicola River, and found only one incident where discharges were less than basin inflows when addressed on a weekly time-step. That incident was during the weekend of 21 March, after a large rain event in the upper basin. It was understood by both agencies that releases did not catch back up with the basin inflows for several days after the rain event while waiting for the water to move downstream from the upper basin to the lower basin. Jerry stated he considered the Mobile District water managers were doing a pretty good job at implementing the Interim Operations Plan, and suggested that the longer time-step (i.e., 7-day rather than 3-day average) was probably more appropriate to manage and monitor for consistency with the Interim Operations Plan due to the logistics of managing flows within the system.

3. Measurement of Average Basin Inflows and Releases from Jim Woodruff Dam. Memphis and Cheryl described Mobile District efforts to manage releases from the dam to meet 100 percent of basin inflows by monitoring the 3-day average basin inflows, as described in the Interim Operations Plan, and the difficulties in matching releases to basin inflows over the short-term. There can often be a several day delay, as long as 7 to 10 days, before rainfall received in the upper basin can be moved and released from Jim Woodruff to the Apalachicola River. It is also often difficult to predict how much the basin inflow will increase for a given rainfall event and to anticipate the necessary adjustments to releases to assure that 100 percent will be released over the short timeframe. Another concern was that the gradual ramping rates also must be considered as part of the computed release, and often result in much more gradual ramping rates than the rate of declining basin inflows, which means more storage would be required to provide the gradual ramping of releases. When managing releases after rain events, Mobile District has accordingly often released less than the peak basin inflow during the rain event, but used the balance to assist in providing smoother transitions and the more gradual ramping rates. This represents more of a volumetric computation of the amount of inflows and releases, rather than trying to follow daily fluctuations in the basin inflows - which is difficult if not impossible to achieve from a system management perspective. Jerry Z. noted that there should be a higher priority on providing the smoother transitions and gradual ramping rates in order to prevent standing of sturgeon or other fish, and to be protective of mussels, especially during low flow conditions. It was therefore agreed that the Corps should continue to "smooth" off the peaks of the rain events in order to use the excess basin inflow to provide the more gradual ramping rates following the rain event. Jerry Z. also liked the idea of the 7-day volumetric computation of basin inflows and releases, and recommended it be computed from Wednesday to the next Tuesday (since the Mobile District weekly Water Management meeting is typically on Wednesdays). Computations of inflows and releases and back-casting for consistency would be monitored on the weekly basis, and any adjustments could be made the next week as necessary

to compensate for any shortfall of releases the previous week. Adjustments would typically consist of sustaining releases at a base level for a longer period, increasing releases incrementally if basin inflows had increased, or decreasing releases incrementally if basin inflows had declined. Such a volumetric measurement of inflow versus releases could also be monitored for the entire March through May sturgeon spawning period. Daily water management decisions would then focus on ramping rates for the river and the reservoirs during the fish spawn periods.

Bill Smallwood noted that he had been receiving multiple complaints about rapid declines in Walter F. George Lake levels after rain events, as water was rapidly moved downstream to meet the basin inflow targets on the Apalachicola River. The alternative of managing on a longer time-step, and the volumetric method for computation of basin inflows and releases, would likely minimize fluctuations in river stages, and may also minimize rapid fluctuations in the upstream reservoirs following rain events.

4. <u>Computation and Management of Percentage of Basin Inflows to be Released</u>. The Interim Operations Plan requires a minimum of 70 percent of basin inflows to be released during certain times of the year and certain flow conditions. Similar to the above discussion, this has been difficult to achieve during and immediately following rain events on a short-term basis. Basin inflows may rapidly rise and fall during a rainfall event, but inflows from a rainfall event in the upper basin may take several days to reach the lower basin for release to the Apalachicola River. It was agreed to use the same 7-day volumetric computation as described above when determining the amount of inflows that will be stored and released, and make adjustments in releases as necessary the following week. Any excess storage may therefore be used to assist in augmenting or sustaining flows for longer periods following the rain event.

5. <u>Ramping Rates</u>. The Interim Operations Plan specifies ramping rates of 0.5 ft/day to 1.0 ft/day when flows/releases exceed the capacity of the powerhouse, and 0.25 ft/day to 0.5 ft/day or less when passing flows/releases through the powerhouse. The Interim Operations Plan specified that the powerhouse capacity was 18,000 cfs (capacity of previous turbines); however, it was noted that the capacity of the new turbines was closer to 16,000 cfs (5,500 cfs per turbine). There was much discussion about the difficulties of achieving specific ramping rates at such fine increments as 0.25 ft/day. Although a 500 cfs reduction of flow is generally equivalent to a 0.25 ft reduction in stage at Blountstown, and a 1000 cfs reduction is equivalent to a 0.5 ft reduction at Blountstown, this relationship can be affected by many other factors and is attenuated as you proceed downstream. Generator outflow is based on head differentials at the dam, which can vary with different flow conditions. Lockages can provide additional flow (estimated at 380 cfs per lockage). Efforts to produce a gradual change in stage by switching on and off units or opening trash gates, spill gates or other operations at the dam obviously cannot produce a very precise or predictable change in stage. It was therefore suggested that instead of trying to manage for changes in releases to meet a specific ft/day reduction in stage, water management operations would provide for a specific gradual ramping down of flows, with the understanding that the flow reduction was also equivalent to a gradual reduction in stage (e.g., reduction in flow of 500 cfs per day would be equivalent to an equivalent reduction in stage of 0.25 ft/day as measured at Blountstown gage).

Jerry Z. also recommended that the ramping rates be tied to the Chattahoochee gage rather than the Blountstown gage. Memphis noted that access of the Powerhouse to the Chattahoochee gage data had recently been removed by the U.S. Geological Survey, but that he had already initiated steps to restore access by the Powerhouse to the gage. Jerry also noted that achieving the 0.25 ft/day ramping rates (i.e., 500 cfs reduction in flow) was most important during the lower flow conditions in the upper river, in order to not strand fish and expose mussels. Attenuation of the ramping rates occurs downstream, which means managing for these rates in the upper river by referencing the Chattahoochee gage is the more conservative approach.

6. "Mini-Peaking" Operation at Jim Woodruff Powerhouse. Operations personnel pointed out that there has been for several years a "mini-peaking" operation at Jim Woodruff powerhouse. Under contractual agreements Mobile District has been providing a daily generation schedule of 36 MW for one or two hours a day, typically between the hours of 5:00 p.m. to 6:00 p.m. It is proposed to continue this operation under the Interim Operations Plan. Fluctuations in stage during the "peaking" operation are generally more pronounced during low flow conditions, but appear to be less than one foot as measured from the base flow. During higher flow conditions there may be no peaking if the 36 MW is achieved during normal releases and generation schedules. Jerry Z. stated he had noticed this peaking operation in his previous review of the Chattahoochee gage hourly data, that it represented a temporary spike above the base flow, and was not a severe or long-term fluctuation as in typical peaking plants. Jerry agreed to review the biological literature to see if he can ascertain how the species would react to such short-term fluctuations. He also noted that in computing or monitoring for rates of change on a daily basis, the daily rate of change is generally the average of the hourly rates of change over a 24-hour period compared to the average rate of change for the next 24-hour period.

7. Jerry Z. complimented the Mobile District water managers for their efforts in managing such a complex system to meet the need of the species, and noted that there had been no evidence of problems with Gulf sturgeon spawning this year while implementing the Interim Operations Plan. We agreed that Mobile District should decide on the appropriate management tools for computing the basin inflows and releases and managing ramping rates, based on these discussions and any other pertinent information. Mobile District will provide by official correspondence a description of the proposed adjustments to the operating plan to be considered during the formal Section 7 consultation process. We will then decide how to describe the operation and the appropriate assumptions to be incorporated into the modeling of the Interim Operations Plan. Modeling will be conducted in a team approach between both USFWS and the Mobile District, and will include modeling of the overall Interim Operations Plan on a daily/weekly basis; and some form of modeling to capture the impacts of the "mini-peaking" operation hourly fluctuations. Discussion on modeling efforts are planned to begin next week.

Joanne Brandt

JOANNE BRANDT
Compliance Manager
Inland Environment Team

D-4 Memorandum for Record of 24-25 May 2006 Hydrological Modeling Technical Workshop

CESAM-PD-EI 12 June 2006

MEMORANDUM FOR RECORD

SUBJECT: Jim Woodruff Dam Existing Water Management Operations, Section 7 Consultation, Hydrological Modeling Technical Workshop, 24-25 May 2006

1. A technical workshop was held on 24-25 May 2006 at the Lake Seminole Resource Management Office to exchange technical input on the appropriate modeling approach and assumptions to be used by the U.S. Army Corps of Engineers (USACE), Mobile District, and the U.S. Fish and Wildlife Service (USFWS) during the ongoing consultation on existing water management operations at Jim Woodruff Dam and the potential impacts to federally-listed species and critical habitat that occur on the Apalachicola River (the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, the threatened Purple bankclimber mussel, and the endangered Fat threeridge mussel). Technical representatives from the States of Alabama, Florida and Georgia were also invited to participate in the workshop. A copy of the agenda for the workshop and presentations by participants are attached. The focus of the workshop was on technical matters related to hydrological modeling and ways to capture the impacts of the proposed Interim Operations Plan, as submitted in the Mobile District request dated 7 May 2006 to initiate formal consultation pursuant to Section 7 of the Endangered Species Act of 1973 (ESA). The following representatives from USACE, the USFWS, Alabama Office of Water Resources (AL-OWR), Georgia Department of Natural Resources (GA-DNR), Florida Department of Environmental Protection (FDEP), Northwest Florida Water Management District (NWFWMD), and Florida Fish and Wildlife Conservation Commission (FWCC) participated in the workshop.

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* *Attended 23 May only*
** *Attended 24 May only*

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Gail Carmody*	USFWS	850-769-0552, Ext. 223 gail_carmody@fws.gov
Steve Leitman	Phipps Foundation	850-627-3527 leitman@tds.net
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2. The workshop began with field trips to view the physical limitations of the spillgates at Jim Woodruff Dam (presented by Mr. Richard Johns of Mobile District), and the rock ledge fronting the Chattahoochee River Park on the left descending bank a few thousand feet downstream from the dam which has been documented to serve as suitable spawning habitat for Gulf sturgeon. Mr. Johns demonstrated how the spillgates are opened and closed and discussed the limitations (mechanical and safety) that control the rate of release at various flows. Mr. Johns also explained that all releases at or below approximately 16,000 cfs are made through the powerhouse turbines. Mr. Jerry Ziewitz of USFWS led the discussion at the rock ledge site. Mr. Ziewitz explained the significance of this type of habitat for sturgeon spawning and described recent USACE/USFWS efforts to map suitable spawning habitat, track sturgeon movements, and document areas where spawning is occurring. Following the fieldtrips, the group returned to the Lake Seminole Resource Management Office for the modeling discussion.

3. Mr. Roger Burke (Mobile District) led a brief introduction and then yielded to the meeting facilitator, Mr. Bruce Stedman. Mr. Stedman reviewed the meeting goals, agenda, and ground rules. Highlights and agreements from the meeting sessions are provided below. A copy of each presentation is attached.

4. Session I of the meeting focused on background information regarding relative laws and responsibilities as well as coordination/consultation efforts to date.

a. Ms. Gail Carmody (USFWS) provided an overview of the Endangered Species Act and the Section 7 consultation process. By law, the formal Section 7 consultation must be completed within a prescribed 90-day consultation period, followed by a 45-day period within which the USFWS must issue a final biological opinion. The end of the 90-day consultation period is 6 June 2006, and the biological opinion must be completed by 21 July 2006, unless an extension is mutually agreed to be the Corps and USFWS. Therefore, it was requested that any comments on the modeling approach and assumptions be provided by 6 June so that they can be considered in the assessment of the IOP.

b. Ms. Joanne Brandt (Mobile District) followed with a chronological discussion of the activities that have occurred during informal and formal consultation with USFWS regarding USACE operations and impacts to listed species in the Apalachicola River. Mrs. Brandt's presentation described the elements of the interim operations plan (IOP). The intent of the IOP is to provide year-round operations to support flow needs for sturgeon spawning, young sturgeon, mussels, and host fish for mussels; minimize or avoid impacts of low flow operations on listed species or critical habitat; provide for storage when water is more plentiful to allow for future augmentation during low flows in support of mussels; and to minimize conflicts with management for other fish and wildlife species (e.g., reservoir fish management).

5. Session II of the meeting focused on the IOP.

a. Mrs. Brandt described the purpose of the IOP and provided a detailed description of the various elements of the IOP (see IOP Table handout attached). Discussions generated by these presentations focused on clarifying the conditions of the IOP and describing how the various thresholds were determined.

b. Mr. Memphis Vaughan (Mobile District) followed Mrs. Brandt with a presentation outlining the lessons operators have learned from implementation of the IOP during the spring sturgeon spawning season. As a result of the lessons learned, the Corps has identified several adjustments to the IOP that can minimize the potential for over-releases due to the ramping requirements and travel time to move water downstream. These include changing from a 3-day computed average to a 7-day computed average, and using volumetric computations to track BI and releases, with flows used to meet ramping rates included in the volumetric computations. Mr. Vaughan also described that there is a consistent discrepancy between the Woodruff discharge ratings through the spillgates or turbines and the Chattahoochee gage. Generally the difference is 1,000 to 2,000 cfs, but occasionally it can be as high as 4,000 cfs. Representatives from the State of Georgia stated that the discrepancy was consistently around 6% over-release compared to the Woodruff ratings, based on discussions with the United States Geological Society (USGS) and suggested that the Chattahoochee gage should be used as the reference for controlling releases in order to avoid over-releases that could result in a significant amount of storage being lost from Lake Lanier. Mobile District personnel noted that springs, boils and seepage could explain a portion of the discrepancy, but is probably not that significant. They also noted that we would need to confirm that the accuracy of the Chattahoochee gage has been recently updated (generally USGS will visit the gage six times a year). Mr. Doug Otto (Mobile District) explained that the Apalachicola, Chattahoochee, Flint Rivers (ACF) total basin inflow is a computed value, derived directly in part from the Corps Jim Woodruff outflow. If that computed ACF total basin inflow is then compared to the outflow measured at another gage, in this case the USGS Chattahoochee Gage, then large differences between total basin inflow and outflow could be inferred, that may in-fact be partially or wholly due to the difference in flow reporting between the Corps published Jim Woodruff outflows and the USGS mean daily flow values reported at the Chattahoochee gage.

6. Session III of the meeting consisted of presentations summarizing the recent modeling efforts conducted by the USACE and USFWS.

a. Mr. Vaughan began the modeling discussion with a description of the Excel Spreadsheet Model he developed to analyze the impacts of the IOP on system wide operations. He noted that this model was not as robust as STELLA or HEC-5, but that it was created as a quick "first cut" tool to determine if various plan alternatives were feasible from an operations standpoint. The model compared 2000-2001 historical data (period of recent drought) with and without the conditions of the IOP in place. Mr. Vaughan also noted that models are better at depicting the results of average conditions rather than extreme conditions.

b. Mr. Steve Leitman (Phipps Foundation) and Mr. Ziewitz summarized the assumptions and results of the STELLA model run with the IOP conditions. Mr. Leitman described that he worked for a non-profit organization and was asked by USFWS to assist with the IOP modeling based on his knowledge of STELLA. They utilized the Florida version of the STELLA model with modifications made in coordination with USFWS and the Corps. Mr. Leitman agreed to share the EXCEL Spreadsheet and copies of the STELLA model used with those interested. The following assumptions were integrated into the STELLA model:

- 2001 unimpaired flow data set
- 1989 Draft WCP Hydropower demands based on zone levels
- 1989 Draft WCP rule curves for reservoirs
- No releases for navigation
- Model utilized 2000 forecasted demands for withdrawals, except for the Atlanta metropolitan area the actual demands for 1998 – 2001 (monthly averages) were used.
- Agricultural demands in Flint River Basin were based on 621,000 acres for agricultural withdrawals and a dry year multiplier of 1.2. This measurement was checked against actual gaged flows and was comparable. (NOTE: Steve stated a few days after the workshop that the multiplier is 1.4.)
- Standard minimum flow requirements at Columbus, Peachtree Creek, and Woodruff Dam

State of Georgia representatives stated that they have new data for computing agricultural demands in the Flint River basin and they will provide that information to the various modelers.

Mr. Ziewitz described the conditions for the "Environmental Baseline":

- Does not include effects of action under review
- Does include the effects of past operations at ongoing projects
- Historic flow is calculated using Chattahoochee gage record

Mr. Ziewitz further explained that the STELLA model does not account for routing times, but utilizes a daily time step calculation for Woodruff releases. The STELLA model also utilizes the existing upstream project rule curves to prorate support for the downstream reservoirs. Their STELLA model used a sliding ramping rate for flows below 20,000 cfs of between 0.5 to 2.0 ft/day (this rate may need further clarification). Mr. Ziewitz noted that several questions remain regarding the STELLA model, such as, how to make the model more realistic or more closely approximate the actual operations by the Corps to meet the IOP. USFWS stated that they would use the STELLA model and/or another model such as HEC-5, as determined appropriate.

c. Mr. James Hathorn (Mobile District) followed the STELLA model presentation with a presentation on modeling the IOP using the HEC-5 model. Mr. Hathorn used the Comprehensive Study "Black and White" model as the basis for building the IOP model (this is basically the same operations included in the 1989 draft WCP, with some adjustments to depict current operations). The following assumptions were integrated into the Mobile District IOP HEC-5 model:

- 2001 Unimpaired flow data set (same as STELLA)
- Hydropower based on current use patterns
- Agricultural demands in Flint River Basin were based on 2000 projected Agricultural demands with a wet year multiplier of 1.7
- Ramping rates were captured by utilizing minimum flow requirements at the Chattahoochee gage and a specific flow was computed for a 1 ft change and divided by 0.25 or 0.5 (based on requirements of IOP) to determine the corresponding rate
- No releases for navigation
- Minimum flow requirements at Atlanta = 750 cfs, Columbus=1,850 CFS (WP > 621.6), 1,200 CFS (WP < 621.6),;
- Continuous release of 675 cfs from West Point (house unit), 450 cfs from Buford (house unit), 100 cfs from Jim Woodruff (lockages)

Mr. Hathorn noted that one of the significant differences between the USACE model results and the GA-DNR model results was due to differing agricultural demands entered into the models. The GA-DNR had higher agricultural demands. He stated that we should ensure these are actual current demands and not projected future demands. Representatives for the State of Georgia explained that the agricultural demands they utilized were based on the most up-to-date agricultural studies. Another difference was in the hydropower generation rates – the Corps model used current hydropower generation schedules which decrease when moving to lower zones, which reflects drought contingency cutbacks in generation as lake levels decline. Before finalizing the models, Mr. Hathorn noted that we should model the critical period in the 1980s and also perform a "reality check" to assure the model reflects "real life" operations.

d. Mr. Wei Zeng (GA-DNR) presented the results of their modeling of the IOP using HEC-5. Mr. Zeng used the Comprehensive Study Existing Condition model as the basis for building the IOP model. The following assumptions were integrated into the Georgia IOP Hec-5 model:

- Standard minimum flow requirements at Columbus, Peachtree Creek, and Woodruff Dam
- Withdrawal demands based on actual 2000 M&I for Atlanta area
- Additional demands for firm hydropower
- Georgia used the Jim Hook 1999-2003 UGA Study and the Lynn Torak USGS Study to derive updated Flint River agriculture withdrawal demands; separated ground and surface water demands at 3 levels (wet, moderate, and dry years) –they used the worst case actual dry year demands without current program in place to cap withdrawals
- Included releases for navigation
- No ramping rate, but included 10% additional release above 100% basin inflow

Discussion of the Georgia model led to a more in depth discussion of the agricultural demands calculations. Reports on the GA-DNR(EPD) website outline the plan for buying up irrigation water and the previously noted studies. The worse case scenario is based on actual use, but future demands could be less due to GA-DNR(EPD) management efforts to reduce irrigation. The USACE needs to determine what data to use for the Flint River Basin agricultural demands. It was suggested that the unimpaired flow data set may need to be updated to reflect the new agricultural demands. Additional questions include: can HEC-5 provide for variable storage rates between 70% and 100% of the basin inflow (BI)? Mr. Zeng also suggested:

- Reduce requirement for BI ramping rate or don't capture the peak BI/release
- Don't provide for firm hydropower during abnormally dry or drought conditions
- Use updated information on sturgeon spawning data. The current thresholds of 20,400 cfs and 37,400 cfs are based on spring spawning data when rainfall was above average - 3 of the 4 data points for egg collections occur on days where flows were above 75% exceedance (these flow levels would not occur in 3 out of 4 years) and the other data point occurs on a day with flows at 50% exceedance (this flow level would not occur half of the time).
- Use the Chattahoochee gage data which is more accurate than the USACE Jim Woodruff release ratings

7. Ms. Carmody concluded the first day with a discussion of the next steps in the Section 7 consultation process. She noted that any additional biological or modeling info needed to be shared with USFWS as soon as possible since the deadline for consultation was approaching (90-

day consultation period ends June 6, at which time the 45-day period to write biological opinion begins). Ms. Carmody also noted that the proposal for listing critical habitat for the listed mussel species was scheduled to be released on 31 May. USFWS will consider the IOP impacts to mussel critical habitat primary constituent elements (including flow) and whether or not the proposed action appreciably diminishes the value of the primary constituent elements. Ms. Carmody re-emphasized the point that USFWS must err on the side of threatened and endangered species when definitive data is not available (although safety is also a consideration). However, USFWS does not anticipate a jeopardy determination for the proposed action. Her take away message noted:

- USACE must determine the definition of the proposed action
- Re-initiation clause allows for modifications to the BO if new information warrants a change
- Once Section 7 consultation is initiated it must be concluded within the specified time frames with opinion based on best available information
- Monitoring and adaptive management are important especially for complex situations like this

Gail re-emphasized that the 90-day consultation period ends 6 June and then the 45-day period to prepare the biological opinion begins.

8. The second day of the workshop consisted of a round table discussion of the models, the assumptions utilized, and clarification of topics addressed the previous day. The recap of this discussion is presented by general topic.

a. Section 7 Consultation: Ms. Carol Couch (GA-DNR) requested a definition for or the boundaries of “new action” in regards to modifying the proposed action and triggering re-initiation of consultation. The numbers in the IOP are a starting point for consideration in the consultation process. USACE and USFWS agreed that minor changes to the IOP such as refinement of analysis tools would not be considered a new action. However, more significant changes such as modifying the framework, threshold flow values or decision rules in the IOP would likely require re-initiation based on the re-analysis of new information. The current timeline for the consultation may prevent consideration of the 2006 sturgeon spawning data if not available soon. If the new data suggested that the thresholds needed modification, an extension of the consultation period or re-initiation of consultation could occur. Requests for re-initiation of consultation must come from the action agency or USFWS, and would be triggered by either new information or a significant change in the description of the Federal action. Due to a number of reasons, the Corps is reluctant to request an extension of the consultation process.

b. Computing Basin Inflow: Drought contingency is built into the IOP by the requirement to release at least BI during low flow periods (below 20,400 cfs during Mar-May; and below 8,000 cfs during the remainder of the year.). The intent is that when releasing 100 percent BI, reservoir levels would remain steady while river stages gradually decline as BI declines. Basin Inflow is calculated by summing the net local inflow for all projects in the system. Net inflow at each project is calculated by subtracting the measured outflow from the measured change in storage. All agreed that the Chattahoochee gage will be utilized for calculating BI and measuring releases. The Chattahoochee gage data is already present in the models. It should be noted that due to the way that BI is computed, all consumptive water losses such as agricultural, municipal, and industrial water withdrawals/returns, as well as lake evaporation, are already subtracted and are not reflected in the BI quantity. Also, the IOP specifies minimum releases and there will at times be releases greater than the computed BI, due to “real life” delays in moving water downstream, the need to ramp down slowly; to augment flows at or above 5,000 cfs; and at times in order to provide additional mitigation flows when additional water is available.

3-Day Average vs. 7-Day Average and Volumetric Measurement for computing BI and releases: The 3-Day Average was initially proposed in the IOP, but results in frequent fluctuations in releases and tends to result in possible over-releases due to frequent need to ramp down following rain events and delays in routing flows downstream. The Corps and USFWS both recommend that a 7-Day Average more accurately captures “real life” operations than the 3-day average, is easier to manage from the water management perspective, and produces few fluctuations in flows and therefore less disruption to the species. The 7-day average will result in smoother transitions. It is also proposed to track compliance with the 7-day release by making a volumetric computation of the 7-day BI and assuring that the equivalent volume is released to the river. This should assist in more closely meeting the intents of the IOP. For example, when matching the volumes of BI and releases more closely, the intent to meet reservoir fish spawning SOP guidance by releasing 100% of BI as closely as possible should result in reservoir levels remaining relatively steady during the fish spawn. The models will not require operating for the steady reservoir levels, but will measure how successful operations are in meeting this intent. The USACE will likely use 7-Day Average calculations and the volumetric computations to determine day to day operations. It was suggested that the running 7-Day Average should be utilized for the models as well. It was noted that the HEC-5 and STELLA models do not account for routing times downstream, but using a 7-day average will compensate for this to some degree.

c. Flint River Agricultural Demands: GA-DNR utilized two studies to determine the agricultural demands in the Flint River Basin. The two studies modeled irrigation demands for different crops during 1998 – 2003. The studies described irrigation demands for wet, typical, and dry years. GA-DNR utilized the worst case demands for dry year data for the Flint River agricultural demands in their model. GA-DNR agreed to share this data with the other modelers as well as provide copies of the 2 studies and current rules and regulations for managing agricultural withdrawals (which require reduced withdrawals during dry years). However, for modeling purposes, GA-DNR confirmed that their program to cap irrigation demand should result in Agriculture demands similar to those experienced during 2000, so the year 2000 demand already incorporated into the unimpaired flow dataset would be appropriate for these modeling purposes.

Ted Hoehn of Florida asked how the models address Agriculture demands temporally over various climatic conditions. James Hathorn noted that the HEC-5 model used the spreadsheet projections from the Comprehensive Study when the Corps extended the unimpaired flow dataset. Steve Leitman explained that the STELLA model incorporated an estimate of Ag demands which apparently replicates observed Flint River conditions experience in the year 2000. Jerry Zeiwitz noted that their analysis would probably project future impact over only the short-term, perhaps through the year 2010. Georgia indicated they believed that the Ag demand had "plateaued", and would be managed by their plan to purchase irrigation rights during dry periods; therefore, there was probably no need to project future increases in Ag demand to determine future cumulative impacts.

d. . Differences in Modeling Results due to Different Assumptions Between Models: The group identified where there were discrepancies in the assumptions used for the 2 HEC-5 models (USACE and GA-DNR). The significant differences include:

- Flint River agricultural demands
- Hydropower demands – GA-DNR used the previous hydropower demands which included navigation releases. USACE model has no navigation releases and therefore lower hydropower demands. USACE model also requires no hydropower releases if Lake Lanier is below elevation 1069. However, hydropower generation still occurs as incidental benefit to meeting minimum flow requirements.
- Ramping rates

The following was suggested in order to standardize assumptions:

- Use 2000 actual demands for M&I withdrawals,
- Ag demand to be determined soon. Will probably use 2000 Agricultural demands, with possible adjustments to calibrate to actual observed 2000 demands, as used in the STELLA model
- Use USACE hydropower demands since they are the best approximation of current operations
- No releases for navigation (do not use navigation to support extra hydropower generation demand)
- Use standard minimum flow requirements
- Use USACE value for leakages
- Use zone elevations for system balancing and as triggers for hydropower generation

It was noted that the models are not meant to determine the IOP, rather they are meant to reflect the impacts of implementing the proposed IOP.

Mr. Hathorn suggested that the STELLA model be updated with the USFWS/COE agreed upon assumptions and utilized for the Section 7 consultation, due to certain limitations of the HEC-5 model. However, the results of both models should be compared as a check.

e. Unimpaired Flow Data Set: The unimpaired flow data set is being updated to 2004, but has not yet been completed (still awaiting some data from the States).. Also the relationship of Ag pumping to Flint River flow is being evaluated by Georgia and USGS, but is not yet refined. When complete this information could also be incorporated, as appropriate, into the unimpaired flow dataset. However, these changes can not be made prior to the end of the consultation period.

f.. Rule Curve Operation vs. IOP Operation: The IOP affects the timing and rate of refill of the lakes to meet the rule curve, but does not change the rule curves. This results in occasions where the lakes do not refill in accordance with the rule curve. During normal years the lakes will refill in accordance with the rule curve. A period of record analysis will be conducted to determine the impact of the IOP on ability to refill the reservoirs.

9. Subsequent adaptations for Modeling Assumptions.

a. Clarification of Flood Control Ramping Rates. The IOP Table contained a footnote noting that the ramping rates may not be applied during flood control operations. The following description of flood control ramping rates have been agreed to by the Corps and USFWS for incorporation into the models.

- For flows greater than 30,000 cfs, no ramping rate will be imposed
- For flows between 20,000 and 30,000 cfs, ramping rates will be between 1.0 to 2.0 foot/day
- For flows between greater than 16,000 cfs and less than 20,000 cfs, ramping rates will be between 0.5 and 1.0 foot/day
- For flows of 16,000 cfs or less the ramping rates will reflect those shown in the IOP table.

b. Another adjustment has been proposed to reflect a lower upper threshold value for the months of June through February, based on previous data provided by the Florida Fish and Wildlife Conservation Commission on flow needed for potential host fish for mussels. This proposed lower threshold value has been coordinated with USFWS during consultation discussions to assure the flows will still be protective of mussels and host-fish for mussels. The upper flow threshold in the IOP table of 37,400 cfs has been lowered to 23,000 cfs. For flows greater than or equal to 23,000 cfs, at least 16,000 cfs would be released (approximate average monthly flow for months of June through August), and excess BI above this threshold can be stored. For flows of 23,000 or less, but greater than or equal to 8,000 cfs, at least 70 percent of BI would be released (but not less than 8,000 cfs) and up to 30 percent BI could be stored. For flows less than 8,000 cfs, at least 100 percent of BI would be released.

c. The Mobile District will continue to use HEC-5 as the modeling tool to evaluate the impacts of the IOP. Comparisons between HEC-5 and STELLA will continue throughout the consultation and biological opinion formulation.

/s/
JOANNE BRANDT
Compliance Manager
Inland Environment Team

/s/
BRIAN ZETTLE
Biologist
Inland Environment Team

Enclosures
Workshop Presentations

Jim Woodruff Dam Water Management Operations
Section 7 Consultation
Hydrological Modeling Technical Workshop

Lake Seminole Resource Management Site Office, Chattahoochee, FL
24-25 May 2006
Bruce J. Stedman, RESOLVE Facilitator

Workshop Objectives:

- Review and understand what has been done to date regarding informal and formal Endangered Species Act / Section 7 Consultation
- Review and achieve a common understanding of the Interim Operations Plan
- Review and discuss hydrological models of the Interim Operations Plan (especially modeling approaches and underlying assumptions)
- Describe actions needed to complete Biological Opinion

NOTE: All Times Eastern Daylight Time (EDT)

WEDNESDAY, MAY 24

11:00 – 11:10	**Meet at Lake Seminole Resource Management Site Office**
11:10 – 12:30	**Field Trip to Observe Jim Woodruff Dam Physical / Equipment Constraints / Gulf Sturgeon Spawning Site** Purpose: Understanding operations, especially during low-flow conditions Clarifying Questions and Answers
12:30 – 1:00	**Working Lunch** (gather lunch and begin working session)
12:50 – 1:00 **Roger A. Burke**	**Welcome, Introductions, Hopes for the Workshop, Opening Comments**
1:00 – 1:10 **Bruce Stedman**	**Review Meeting Goals, Agenda, and Ground Rules**
1:10 – 1:40	**Session I: Background**
1:10 – 1:20 **Gail Carmody**	**Session Ia: Requirements of Endangered Species Act / Section 7 Consultation**

1:20 – 1:30 **Session Ib: Informal Consultation**

Joanne Brandt

Purpose: Describe what has been done to date regarding:

- Additional Data Collection / Surveys
- Fish Spawn Coordination / Draft SOP (1130-2-9 (Feb 05)
- Low Flow Operations Matching Basin Inflow
- Physical and Operational Constraints at Jim Woodruff Dam

Clarifying Questions and Answers

1:30 – 1:40 **Session Ic: Formal Section 7 Consultation**

Joanne Brandt

Purpose: Describe what has been done to date regarding:

- Interim Operations Plan
- Request to Initiate Formal Consultation, 7 May 2006
- Formal Consultation to be completed by 21 July 2006

Clarifying Questions and Answers

1:40 – 2:40 **Session II: Interim Operations Plan**

Session IIa: Intent of Interim Operations Plan

Joanne Brandt

Purpose: Describe Purposes of Interim Operations Plan

Clarifying Questions and Answers

Session IIb: Elements of Interim Operations Plan

Joanne Brandt

Purpose: Describe and Review Interim Operations Plan Table

Handout: Interim Operations Plan Table

Clarifying Questions and Answers

Session IIc: Lessons Learned

Memphis Vaughan

Purpose: Discuss what operators have learned from recent implementation of Operations Plan

Clarifying Questions and Answers

2:40 – 5:00 **Session III: Status of Modeling Efforts by USFWS/COE**

2:40 – 3:00 **Session IIIa: Spreadsheet Modeling by COE**

Memphis Vaughan

Purpose: Understand spreadsheet model

Clarifying Questions and Answers

3:00 – 3:15 **Break**

3:15 – 3:55 **Session IIIb: Summary of STELLA Modeling by USFWS**

Jerry Ziewitz

Purpose: Understand STELLA model

Clarifying Questions and Answers

3:55 – 4:15 **Session IIIc: HEC-5 and. HEC-ResSim**

James Hathorn

Purpose: Understand HEC models

Clarifying Questions and Answers

4:15 – 5:00 **Session IIId: State Input on Modeling of Interim Operations Plan**

Purpose: State input into how to represent interim operations in hydrological modeling.

5:00 – 6:30 **Session IV: Facilitated Discussion of Modeling**

Bruce Stedman

Purpose: Review and compare modeling assumptions underlying each model in use

Expected Outcomes:

- Data sharing for dam operations
- Understanding operational constraints
- Adequacy of models for handling assumptions
- Facilitated comparison of models; attention to differences with models

6:30 – 9:00 **Break and Dinner**

THURSDAY, MAY 25

8:00 – 8:15
Bruce Stedman
Review of Previous Day; Reconsideration of Agenda

<u>8:15 – 9:15</u>
Bruce Stedman
<u>Session IV continued (if necessary)</u>

<u>Purpose:</u> Complete review and comparison.

<u>9:15 – 11:45</u> **<u>Session V: Review of Modeling Assumptions</u>**

9:15 – 10:130
Bruce Stedman
Session Va: Modeling Assumptions for use in the Interim Operations Plan

<u>Purpose:</u> Facilitated discussion of topic

10:30 – 10:45 **Break**

10:45 – 11:45
Bruce Stedman
Session Vb: Next Steps for Modeling Efforts

<u>Purpose:</u> Facilitated discussion of topic

<u>11:45 – 12:00</u> **<u>Session VI: Process Needed to Complete Biological Opinion</u>**

<u>Purpose:</u> Understand next steps FWS/COE will take

12:00 **Adjourn**

Jim Woodruff Dam Water Management Operations
Section 7 Consultation
Hydrological Modeling Technical Workshop

Lake Seminole Resource Management Site Office, Chattahoochee, FL
24-25 May 2006
Bruce J. Stedman, RESOLVE Facilitator

Workshop Objectives:

- Review and understand what has been done to date regarding informal and formal Endangered Species Act / Section 7 Consultation
- Review and achieve a common understanding of the Interim Operations Plan
- Review and discuss hydrological models of the Interim Operations Plan (especially modeling approaches and underlying assumptions)
- Describe actions needed to complete Biological Opinion

NOTE: All Times Eastern Daylight Time (EDT)

WEDNESDAY, MAY 24

11:00 – 11:10 **Meet at Lake Seminole Resource Management Site Office**

11:10 – 12:30 **Field Trip to Observe Jim Woodruff Dam Physical / Equipment Constraints / Gulf Sturgeon Spawning Site**
Purpose: Understanding operations, especially during low-flow conditions
Clarifying Questions and Answers

12:30 – 1:00 **Working Lunch** (gather lunch and begin working session)

12:50 – 1:00
Roger A. Burke **Welcome, Introductions, Hopes for the Workshop, Opening Comments**

1:00 – 1:10
Bruce Stedman **Review Meeting Goals, Agenda, and Ground Rules**

1:10 – 1:40 **Session I: Background**

1:10 – 1:20
Gail Carmody **Session Ia: Requirements of Endangered Species Act / Section 7 Consultation**

1:20 – 1:30 **Session Ib: Informal Consultation**

Joanne Brandt

Purpose: Describe what has been done to date regarding:

- Additional Data Collection / Surveys
- Fish Spawn Coordination / Draft SOP (1130-2-9 (Feb 05)
- Low Flow Operations Matching Basin Inflow
- Physical and Operational Constraints at Jim Woodruff Dam

Clarifying Questions and Answers

1:30 – 1:40 **Session Ic: Formal Section 7 Consultation**

Joanne Brandt

Purpose: Describe what has been done to date regarding:

- Interim Operations Plan
- Request to Initiate Formal Consultation, 7 May 2006
- Formal Consultation to be completed by 21 July 2006

Clarifying Questions and Answers

1:40 – 2:40 **Session II: Interim Operations Plan**

Session IIa: Intent of Interim Operations Plan

Joanne Brandt

Purpose: Describe Purposes of Interim Operations Plan

Clarifying Questions and Answers

Session IIb: Elements of Interim Operations Plan

Joanne Brandt

Purpose: Describe and Review Interim Operations Plan Table

Handout: Interim Operations Plan Table

Clarifying Questions and Answers

Session IIc: Lessons Learned

Memphis Vaughan

Purpose: Discuss what operators have learned from recent implementation of Operations Plan

Clarifying Questions and Answers

<u>2:40 – 5:00</u>	**<u>Session III: Status of Modeling Efforts by USFWS/COE</u>**
2:40 – 3:00	**Session IIIa: Spreadsheet Modeling by COE**
Memphis Vaughan	<u>Purpose:</u> Understand spreadsheet model <u>Clarifying Questions and Answers</u>
3:00 – 3:15	**Break**
3:15 – 3:55	**Session IIIb: Summary of STELLA Modeling by USFWS**
Jerry Ziewitz	<u>Purpose:</u> Understand STELLA model <u>Clarifying Questions and Answers</u>
3:55 – 4:15	**Session IIIc: HEC-5 and. HEC-ResSim**
James Hathorn	<u>Purpose:</u> Understand HEC models <u>Clarifying Questions and Answers</u>
4:15 – 5:00	**Session IIId: State Input on Modeling of Interim Operations Plan**
	<u>Purpose:</u> State input into how to represent interim operations in hydrological modeling.
<u>5:00 – 6:30</u> **Bruce Stedman**	**<u>Session IV: Facilitated Discussion of Modeling</u>** <u>Purpose:</u> Review and compare modeling assumptions underlying each model in use <u>Expected Outcomes:</u> • Data sharing for dam operations • Understanding operational constraints • Adequacy of models for handling assumptions • Facilitated comparison of models; attention to differences with models
6:30 – 9:00	**Break and Dinner**

THURSDAY, MAY 25

8:00 – 8:15 **Bruce Stedman**	**Review of Previous Day; Reconsideration of Agenda**
<u>8:15 – 9:15</u> **Bruce Stedman**	**<u>Session IV continued (if necessary)</u>** <u>Purpose:</u> Complete review and comparison.
<u>9:15 – 11:45</u>	**<u>Session V: Review of Modeling Assumptions</u>**
9:15 – 10:130 **Bruce Stedman**	**Session Va: Modeling Assumptions for use in the Interim Operations Plan** <u>Purpose:</u> Facilitated discussion of topic
10:30 – 10:45	**Break**
10:45 – 11:45 **Bruce Stedman**	**Session Vb: Next Steps for Modeling Efforts** <u>Purpose:</u> Facilitated discussion of topic
<u>11:45 – 12:00</u>	**<u>Session VI: Process Needed to Complete Biological Opinion</u>** <u>Purpose:</u> Understand next steps FWS/COE will take
12:00	**Adjourn**

Endangered Species Act Overview

For Federal Agencies

Endangered Species Program,

U.S. Fish and Wildlife Service

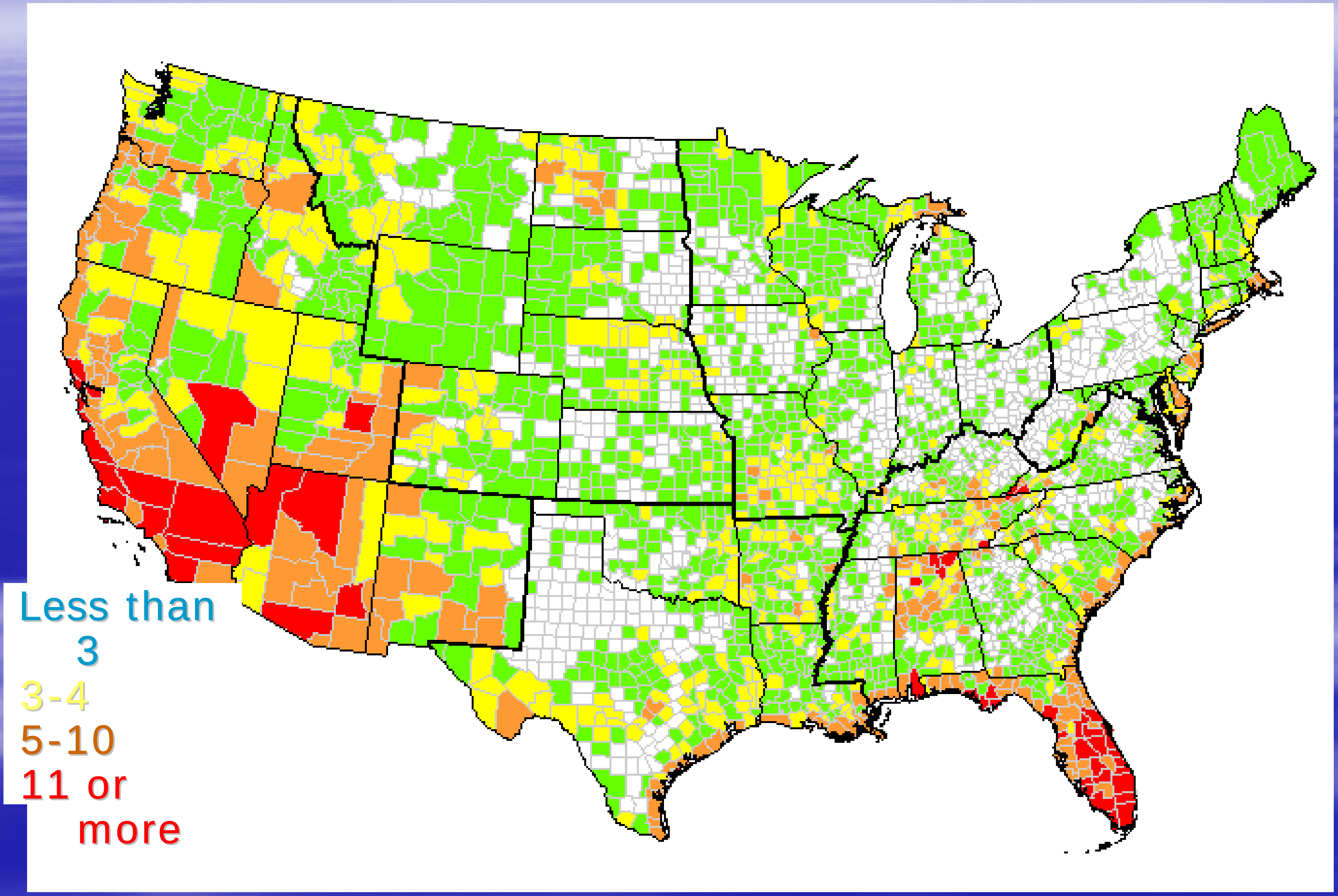
PCFL 2006

Sea Turtles
Gulf sturgeon
Electro shocking
Beach mouse recovery
Feeding red cockaded woodpeckers
Stocking fish
PAPERWORK!
Outreach
GIS Mapping

Purposes of ESA

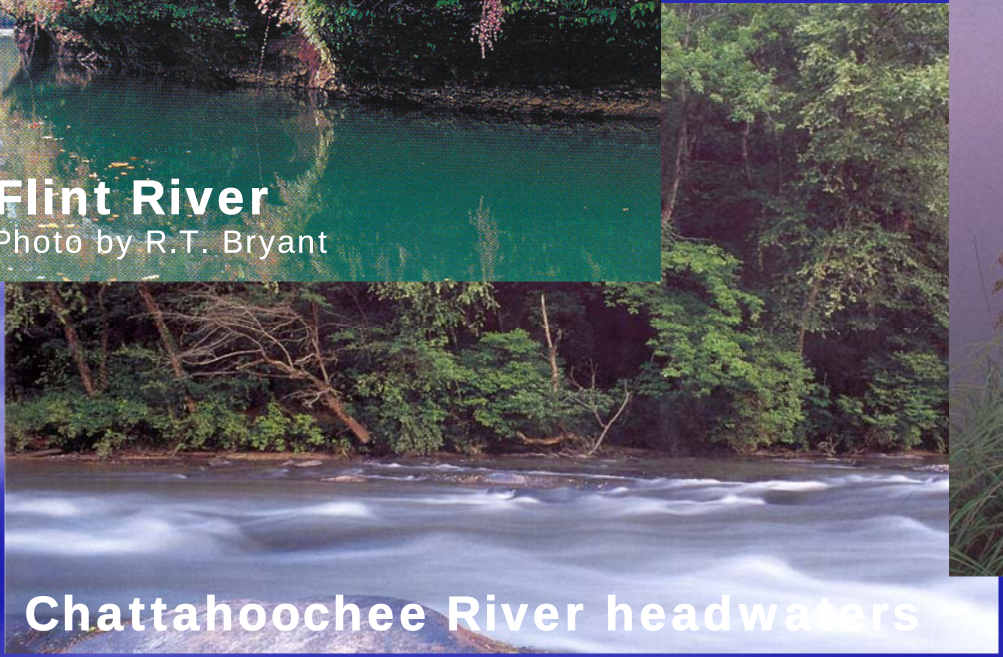
- Provide a means to conserve ecosystems of threatened and endangered species

- Establishes a program for the conservation of threatened and endangered species

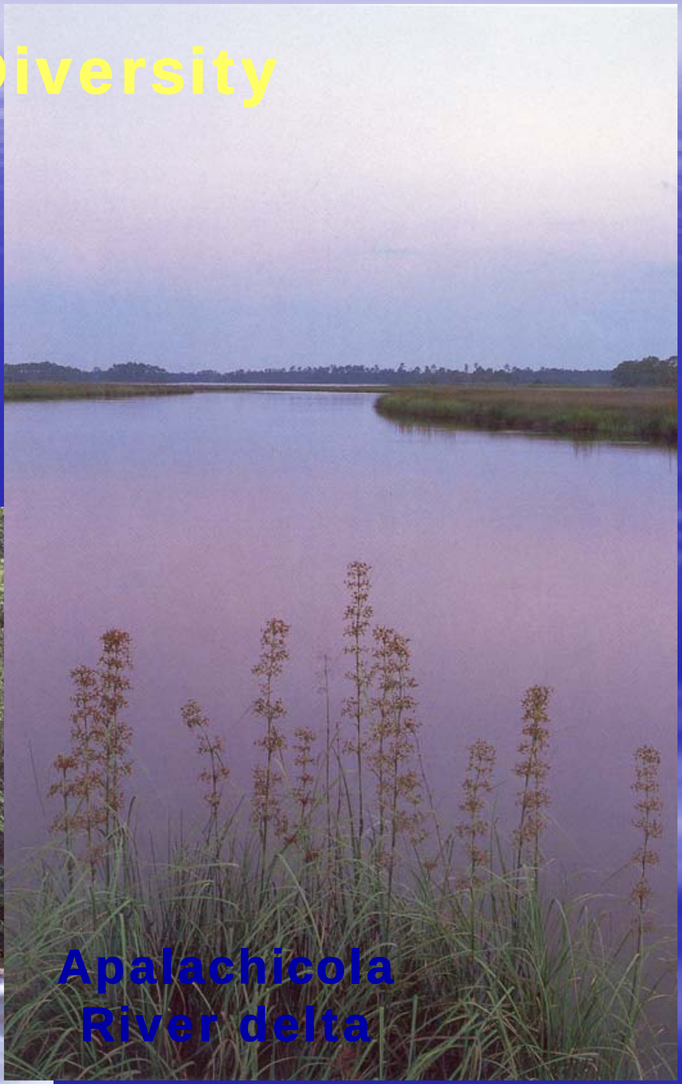

Less than 3
3-4
5-10
11 or more

ACF Basin Aquatic Habitat Diversity

Flint River
Photo by R.T. Bryant



Chattahoochee River headwaters



Apalachicola River delta

Photos by J. & M. Cook

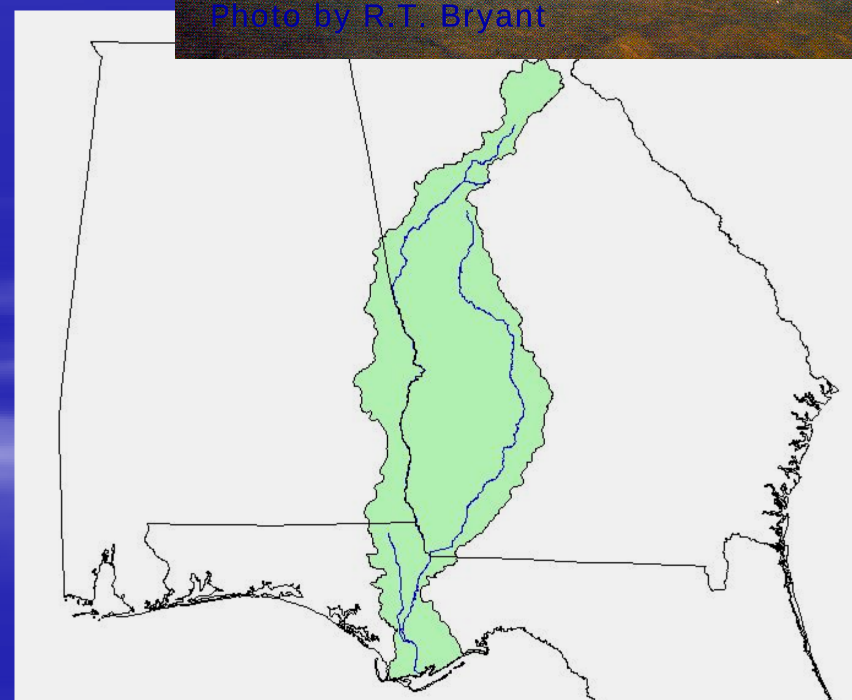
ACF Basin
Aquatic Biodiversity

- Fish: 122 species
- Mussels: 29 species
- Crayfish: 30 species

- Highest US density reptiles & amphibians

- Estuary one of most productive fisheries in North America

- Flint River: 214 miles without a dam



ESA-listed species in the ACF

Gulf sturgeon

Fat three-ridge

Shiny-rayed pocketbook

Purple bankclimber

ESA-Listed Aquatic Species in the ACF Basin

7 species

Fish

Gulf sturgeon(T)

Mussels

Fat threeridge (E)
Chipola slabshell (T)
Purple bankclimber (T)
Shiny-rayed pocketbook (E)
Gulf moccasinshell (E)
Oval pigtoe (E)

Endangered Species Act

- Response to accelerated decline of species
- Purpose is to conserve ecosystems
- Listing a species is a 911 call
- Active conservation to prevent listing and allow delisting

Definitions

- Endangered

  Any species in danger of extinction throughout all or a significant portion of its range

- Threatened

  Any species likely to become endangered in the foreseeable future in all or a significant portion of its range

Endangered Species Act

- Sec. 4 requires listing if possible extinction, requires recovery planning

- Sec. 7 requires Federal agency consultation

- **Sec. 9 prohibits take of a species**

Sec. 7 Consultation

- Every Federal agency must be in compliance with the ESA

- and use their authorities to further the purposes of the Act

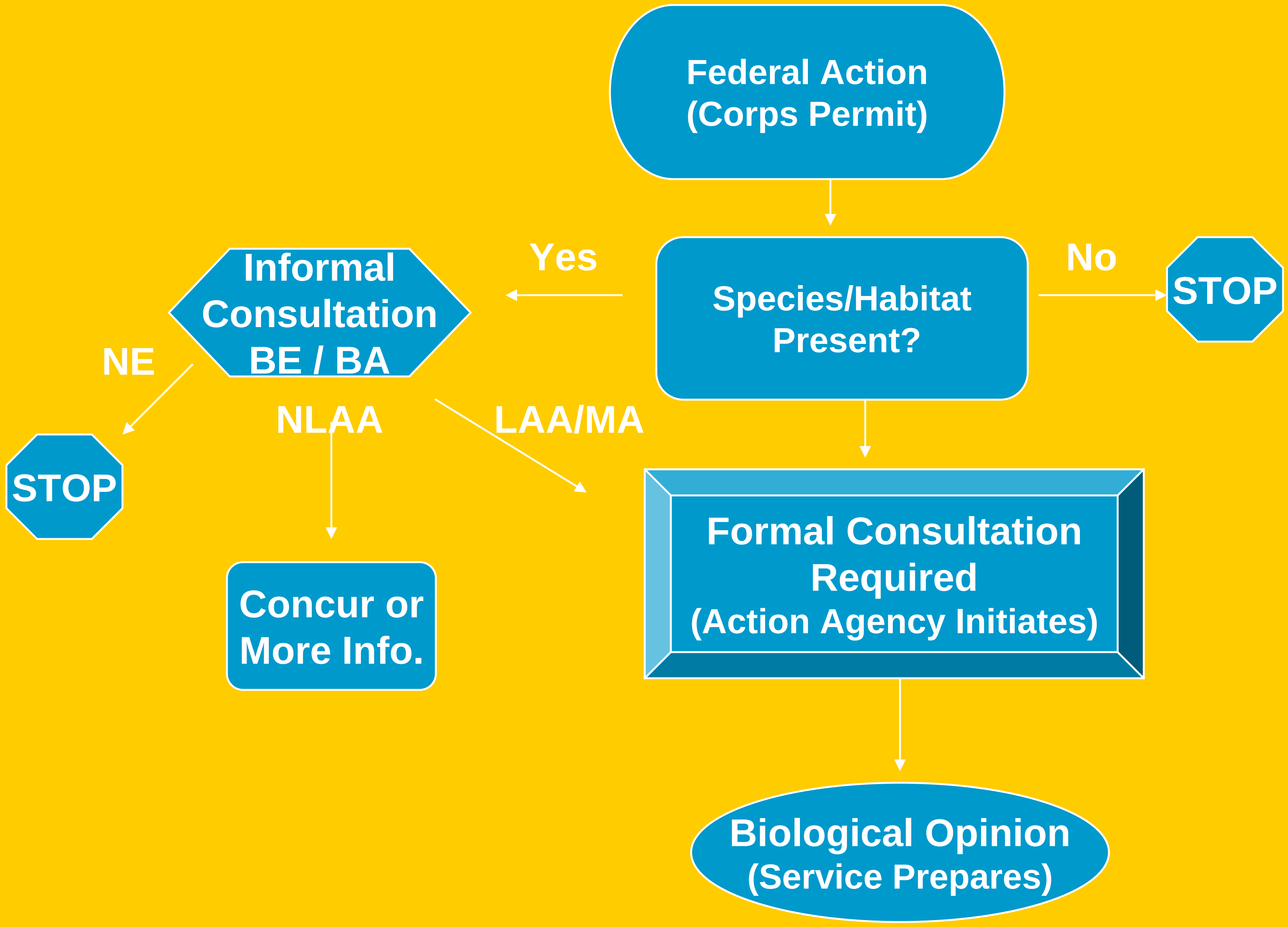
Sec. 7 Consultation

- The role of the Service is to help the action agency be in compliance and avoid Section 9 violation and penalties

- See Consultation Handbook for guidance (www.fws.gov)

Interagency Consultations

- Applies to all discretionary federal actions that:
  - an agency funds, carries out or permits and
  - may affect a listed species or critical habitat
- Conflicts frequently resolved with minor project modifications concurrently with other project planning


Federal Action
(Corps Permit)
Yes
Species/Habitat
Present?
No
STOP
Informal
Consultation
BE / BA
NE
STOP
NLAA
LAA/MA
Concur or
More Info.
Formal Consultation
Required
(Action Agency Initiates)
Biological Opinion
(Service Prepares)

Formal Consultation

Information Needs and Initiation

- ESA requires the action agency to provide the best scientific and commercial data available.

- Within 30 days, the Service provides written acknowledgment of consultation request and advises of any data deficiencies.

Formal Consultation
Time Requirements

- Clock starts when adequate information is provided including Biological Assessment
- Consultation - 90 days
- Biological Opinion - 45 days

Typical Biological Opinion

- Describes the proposed action
- Summarizes the status of the species and critical habitat
- Describes the baseline
- Determines effects of action including cumulative
- Conclusion – jeopardy or adverse modification?
- Incidental take statement
- Conservation recommendations

Biological Opinion

- Take?

No → Done (uncommon)

Yes → Incidental Take Statement to permit otherwise prohibited actions

Section 9

- Applies to Federal and non-Federal.
- “Prohibited Acts” - Prohibit import or export or transport of listed wildlife or plants; also prohibit take and possession of wildlife - but not plants.

Section 9

- “Take” - to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct.

Harm

"Significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3)

Incidental Take

"Take" resulting from, but not the purpose of, an otherwise lawful activity

- Only applies to levels of take that do not cause jeopardy or adverse modification
- Includes reasonable and prudent measures to minimize the take
- Terms and conditions are non-discretionary

Reasonable and Prudent Measures

- All reasonable measures to avoid and minimize extent of take.
- Mandatory.
- Includes monitoring

- Terms and Conditions - included as permit conditions or project plans.

Terms and conditions

- specific methods to accomplish each RPM
  - **clear, precise and enforceable**
  - **only minor changes to proposed action (can’t alter basic design, location, scope, duration, or timing)**
  - **include reporting and monitoring requirements**
  - **salvage and disposition of species**

Biological Opinion

- Draft BO is submitted to Action agency for review
- Federal agency comments completes consultation on reasonable and prudent measures
- Remember: RPMs **can't alter basic design, location, scope, duration, or timing of the federal action**

Endangered Species Act

- It’s about:

- Ecosystems
- Active conservation partnerships
- Balancing species’ needs with people’s needs
- Early planning and coordination is best

Jim Woodruff Dam

Section 7 Consultation

and

Interim Operations Plan

Endangered Species Act of 1973
Section 7 Consultation

- "All Federal agencies shall, in consultation with and with the assistance of the Secretary of the Interior/Commerce, insure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary (Interior/Commerce) to be critical, unless an exception has been granted by the Endangered Species Committee."

Federally Listed Species and Critical Habitat on Apalachicola River

- Gulf sturgeon – listed as threatened in Sep 1991; critical habitat listed Mar 2003
- Fat threeridge mussel – listed as endangered in Mar 1998
- Purple bankclimber mussel – listed as threatened in Mar 1998
- USFWS intends to propose critical habitat for listed mussels on 31 May 2006 – likely to include Apalachicola River

Section 7 Consultation

- Mobile District has been informally consulting with USFWS since 2000 on potential for impact to Gulf sturgeon and mussels
  - Impact of navigation window in Spring 2000 on fish spawning in Apalachicola River
  - Impact of drought operations on mussels in summer of 2000
  - Impact of reservoir fish spawn management on Apalachicola River/Gulf sturgeon spawning in 2002

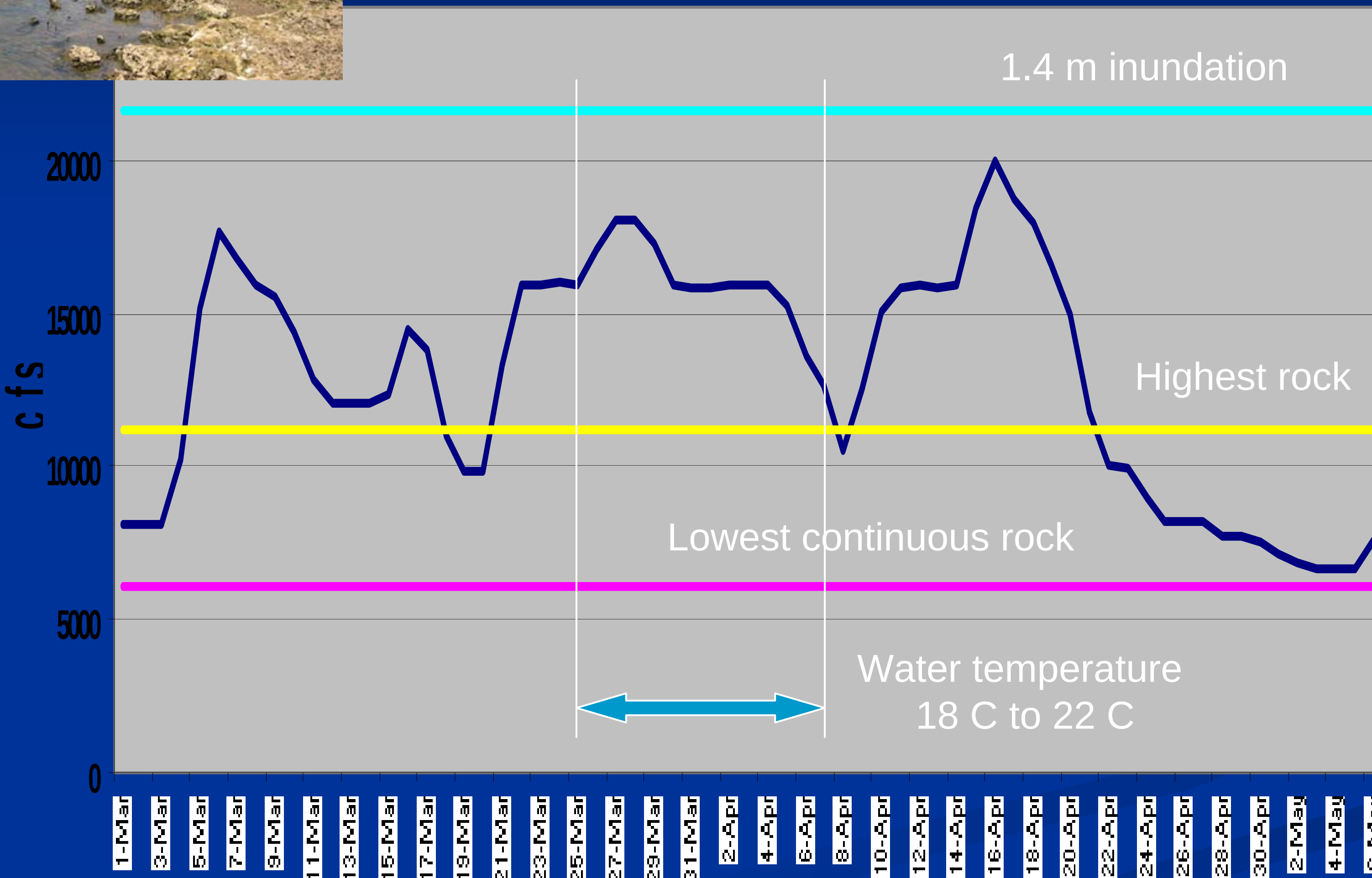
Informal Consultation

- Potential for impact to Gulf Sturgeon or critical habitat for Gulf sturgeon
- Potential for impact to listed mussel species (Fat threeridge and Purple bankclimber mussels)
- Surveys of Gulf sturgeon spawning habitat and flow/depth study
- Mussel surveys and flow/depth distribution study
- Draft SOP for fish spawn operations to include management for Apalachicola River species in addition to reservoir fish spawn management – annual meetings
- Development of low flow operations protocol in 2004 (i.e., match releases to basin inflows)

Gulf Sturgeon Spawning Flow Requirements

- Sampling in 2005 collected sturgeon eggs on rock ledge at NM 105 at flows between 37,400 cfs and 20,400 cfs
- Rock ledge at NM 105 is completely inundated to depth of 4.5 ft. at flows of 30,000 cfs
- At flows of 20,400 cfs approx. 75% of rock ledge is inundated to depth of 4.5 ft.
- Rock ledge at NM 105 becomes exposed at flows of 16,000 to 18,000 cfs
- Spawning habitat is a primary constituent element of critical habitat

Woodruff Discharge 3/1 to 5/6 2002



Flow Requirements for Protected Mussels

- Endangered Fat threeridge mussel and threatened Purple bankclimber mussel occur on the Apalachicola River
- Mussel surveys completed in the mid-1990s through 2003
- Mussel population locations and relative depth distribution have been correlated to flows
- Mussels begin to become exposed at flows of 8,000 cfs or less
- FWS has stated that continued existence of mussels could be jeopardized at flows less than 5,000 cfs

Informal Consultation Ramping Rates

- Attempt to mimic “natural flows”
- Minimize impacts on downstream habitat
- Minimize trapping of fish in out-of-bank or floodplain pools after high flows
- Reduce exposure/mortality of mussels
- Reduce bank sloughing
- Rates: 0.5 to 1.0 ft per day when flows are less than 20,000 cfs; Goal of 0.5 ft per day or less during fish spawning and for mussels

Formal Section 7 Consultation

- Interim Operations Plan for releases from Jim Woodruff Dam to the Apalachicola River
  - Incorporates elements developed or agreed to during informal consultation
  - Based on basin inflow and incorporates new information collected during informal consultation
- Formal Section 7 consultation requested on 7 March 2006
- FWS letter dated 9 March 2006 – intent to complete Formal Consultation by 21 July 2006

Intent of Interim Operations Plan

- Provide year-round operations to support flow needs for sturgeon spawning, young sturgeon, mussels, and host fish for mussels
- Minimize or avoid impacts of low flow operations on listed species or critical habitat
- Provide for storage when water is more plentiful to allow for future augmentation during low flows in support of mussels
- Minimize conflicts with management for other fish and wildlife species (e.g., reservoir fish management)

Interim Plan for March - May

Based on Basin Inflows (BI)

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI >20,400 and < 37,400 cfs, outflow $\geq$ 20,400 cfs and at least 70% of BI
- If BI $\leq$ 20,400 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

Interim Plan for June - February

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI $>$8,000 and $<$ 37,400 cfs, outflow $>$ 8,000 cfs and at least 70% of BI
- If BI $\leq$ 8,000 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

Interim Plan Ramping Rates

- Exceeds Powerhouse Capacity (18,000 cfs)

  0.5 to 1.0 ft/ day*

- Within Powerhouse Capacity and >8,000 cfs

  0.25 to 0.5 ft/day*

- Within Powerhouse Capacity and $\leq$8,000 cfs

  0.25 ft/day or less*

*Consistent with safety requirements, flood control operations, and equipment constraints

U.S Army Corps of Engineers, Mobile District
Interim Operations at Jim Woodruff Dam
and Releases to the Apalachicola River
In Support of Listed Mussels and Gulf Sturgeon

Minimum Releases

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
March - May	>= 37,400	not less than 37,400	Max. known flow of sturgeon spawning in the Apalachicola. All of rock shoal inundated by more than 4.59 ft. Majority of floodplain aquatic habitat (61%) in which mussel fish hosts may spawn is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 20,400 and < 37,400	>= 70% to 90% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases between 70% and 90% of basin inflow would still provide access for spawning to between 74% and 100% of the rock ledge habitat at NM 105.
	< 20,400	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
June - February	>= 37,400	not less than 37,400	Majority of floodplain aquatic habitat (61 %) in which mussel fish hosts may spawn and rear is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 8,000 and < 37,400	> 70% to 90% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (store some water from rain events) in order to allow some refill for future augmentation flows. Water stored during these conditions would be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
	< 8,000	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~18,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less whenever flows are less than 20,000 cfs, and less than 1.0 ft/day at flows greater than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions.
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cabablities.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS recommends the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 37,400 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a sliding percentage between 90% and 70% BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% to 90% BI release would assure that at least 74% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on other habitat or host species requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

Interim Operations Plan

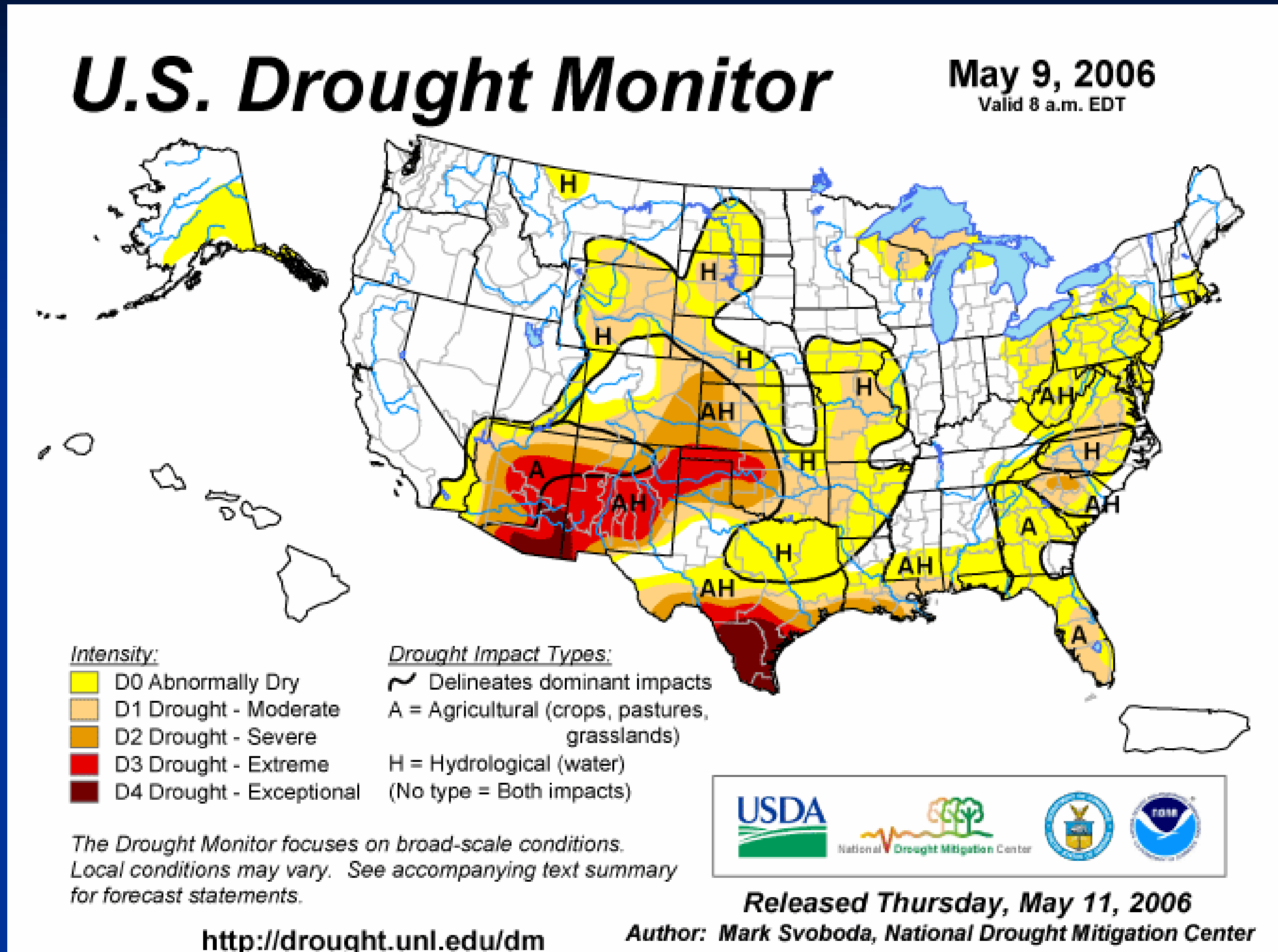
- Numbers in Plan subject to change based on new information
  - E.g., Powerhouse capacity = 16,000 cfs
  - Results of sturgeon spawning monitoring efforts in 2006?
  - How to calculate basin inflows?
  - How to account for ramping rates?
  - What is appropriate threshold for flood control operations?

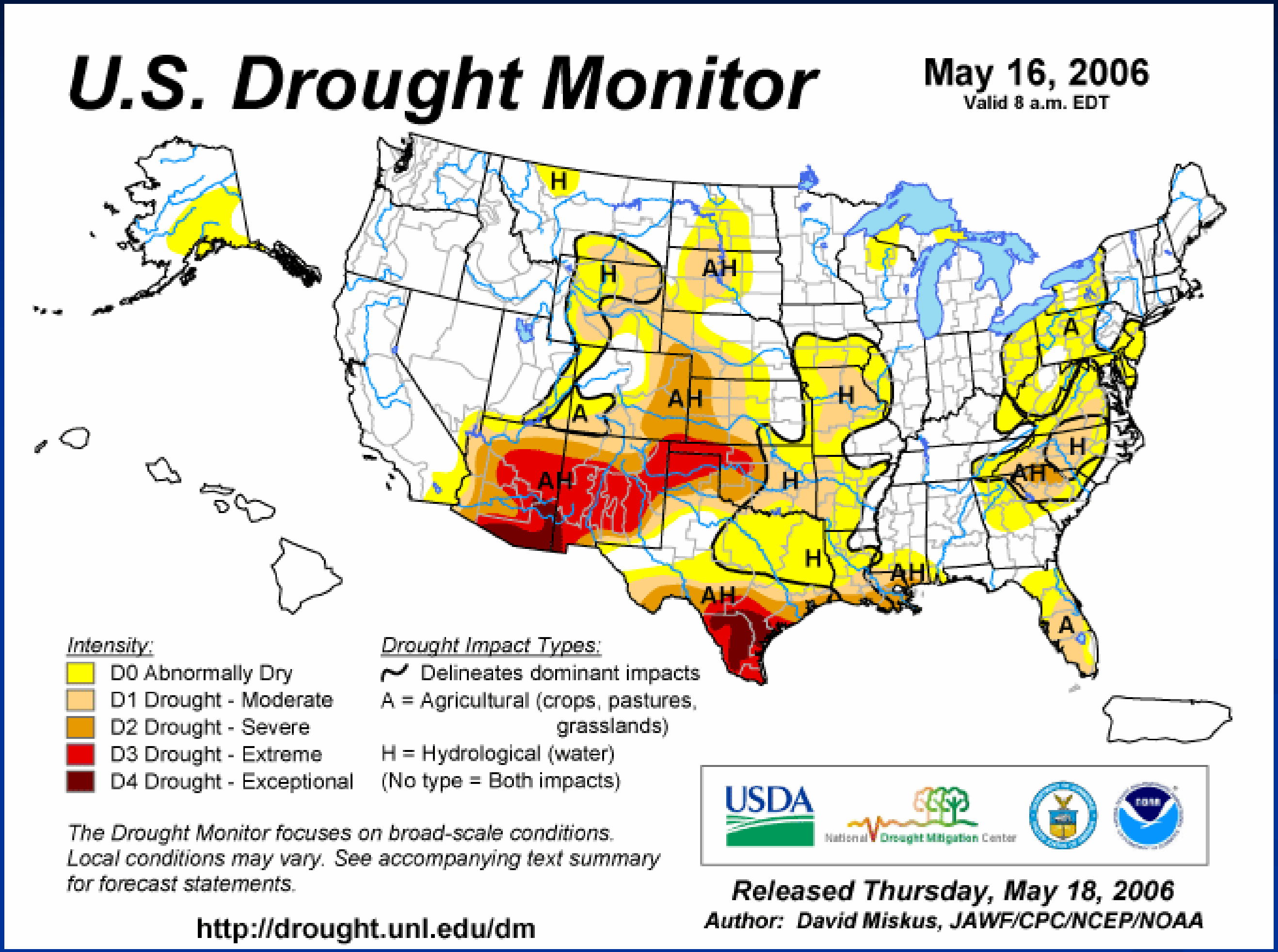
Interim Operations Plan

Lessons Learned

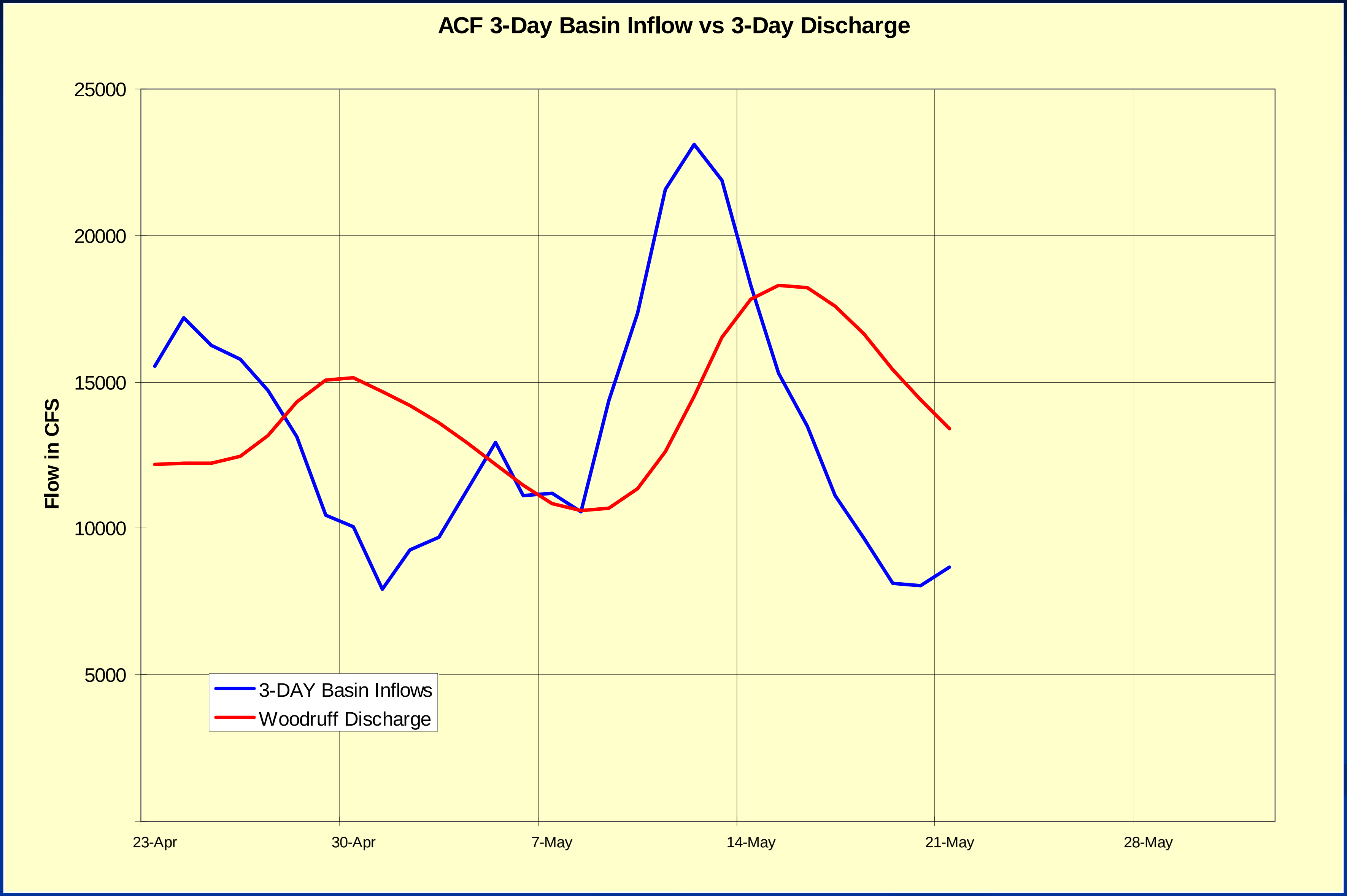
and

Areas of Concern


U.S. Drought Monitor
May 9, 2006
Valid 8 a.m. EDT
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
National Drought Mitigation Center
Released Thursday, May 11, 2006
Author: Mark Svoboda, National Drought Mitigation Center


U.S. Drought Monitor
May 16, 2006
Valid 8 a.m. EDT
H
AH
H
A
AH
H
AH
H
A
H
AH
H
AH
AH
A
Intensity:
D0 Abnormally Dry
D1 Drought - Moderate
D2 Drought - Severe
D3 Drought - Extreme
D4 Drought - Exceptional
Drought Impact Types:
Delineates dominant impacts
A = Agricultural (crops, pastures, grasslands)
H = Hydrological (water)
(No type = Both impacts)
The Drought Monitor focuses on broad-scale conditions. Local conditions may vary. See accompanying text summary for forecast statements.
http://drought.unl.edu/dm
USDA
National Drought Mitigation Center
Released Thursday, May 18, 2006
Author: David Miskus, JAWF/CPC/NCEP/NOAA

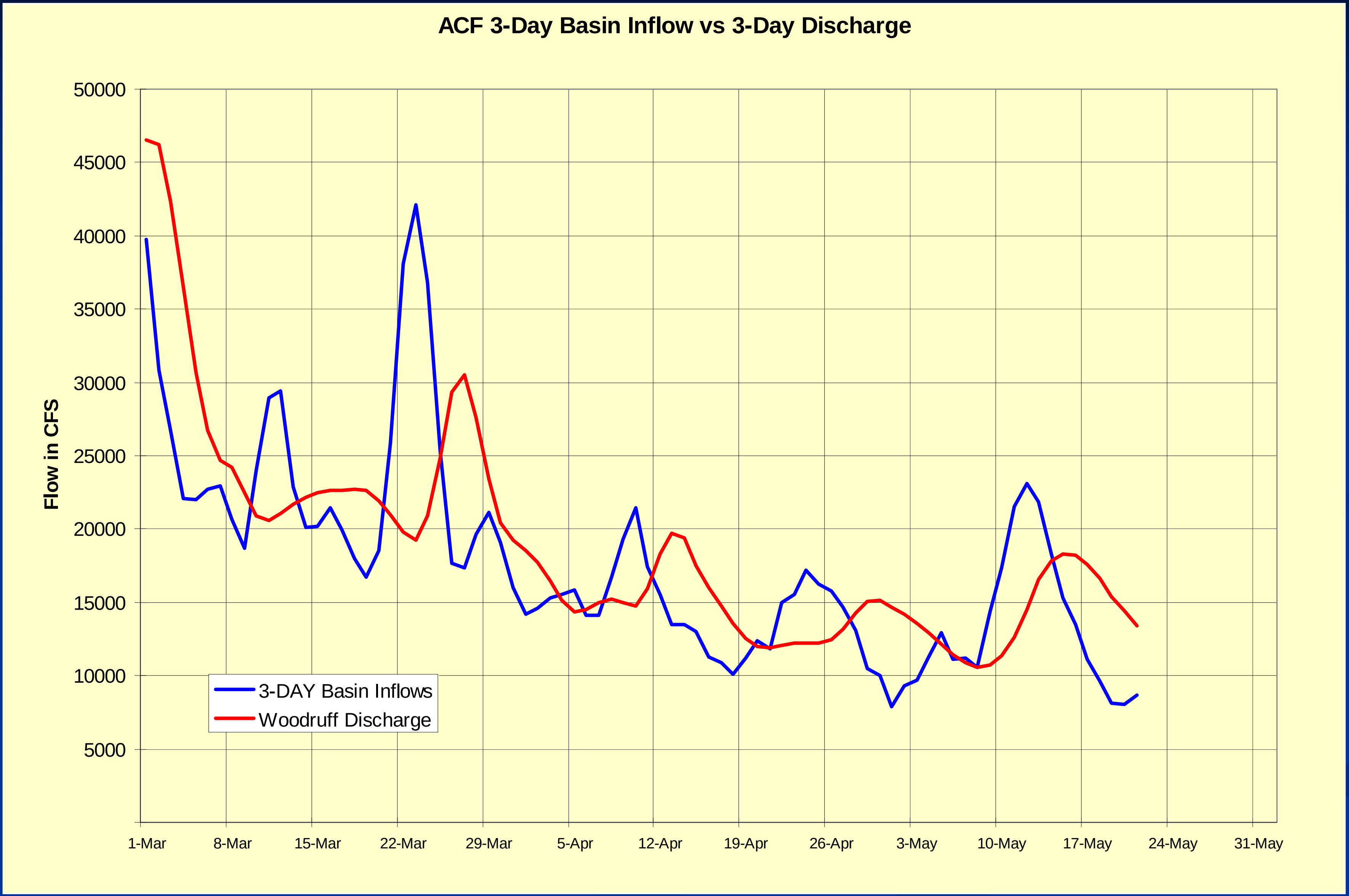
- Ramping Rates Should Be Considered in Balancing Basin Inflow with Releases



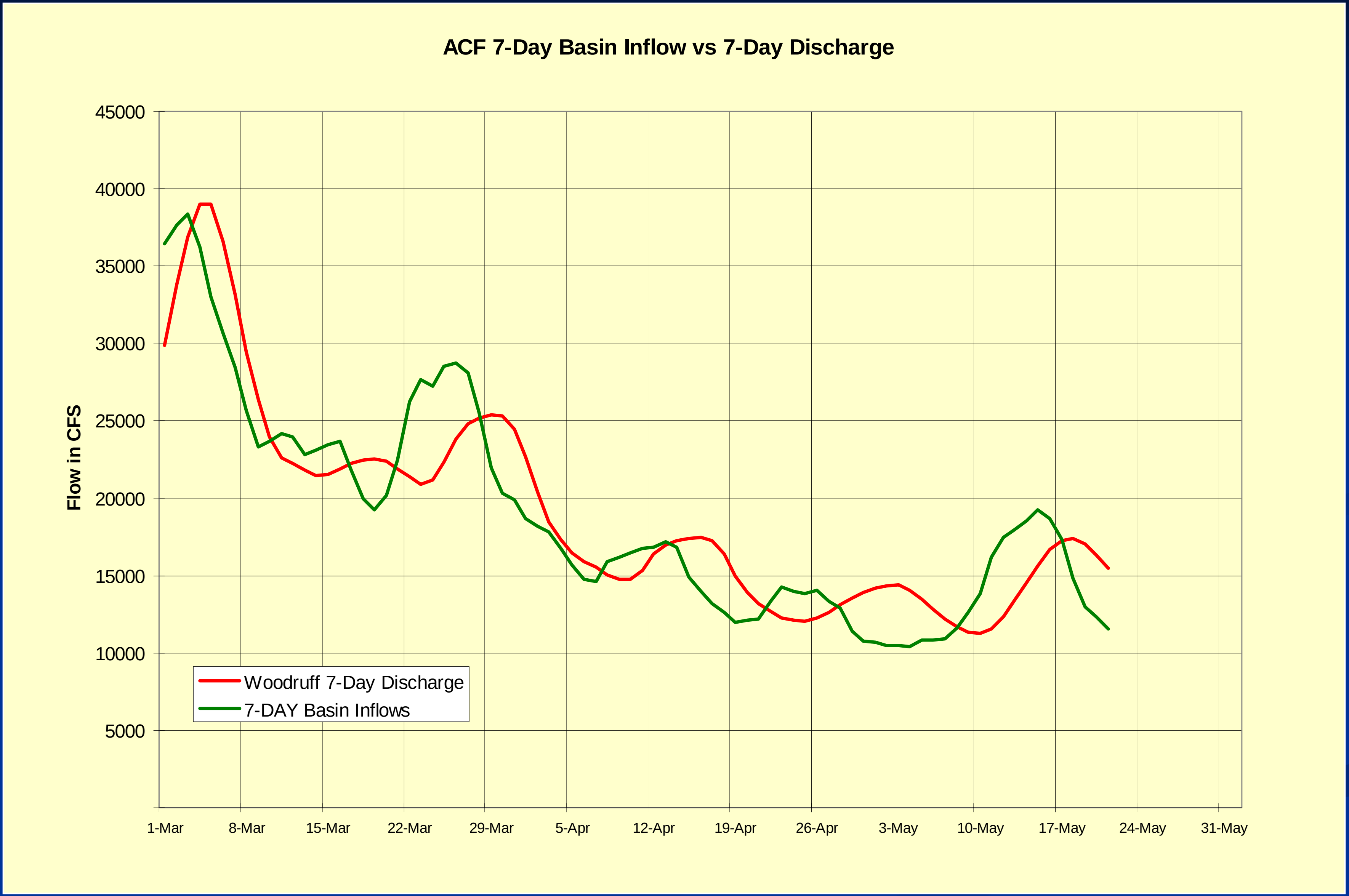
ACF 3-Day Basin Inflow vs 3-Day Discharge
Flow in CFS
25000
20000
15000
10000
5000
23-Apr
30-Apr
7-May
14-May
21-May
28-May
3-DAY Basin Inflows
Woodruff Discharge

- Computation of Basin Inflow – 3-Day Average, 7-Day Average, Longer Period? 7-Day Average provides smoother transition and helps to minimize the impact of the rampdown rates.

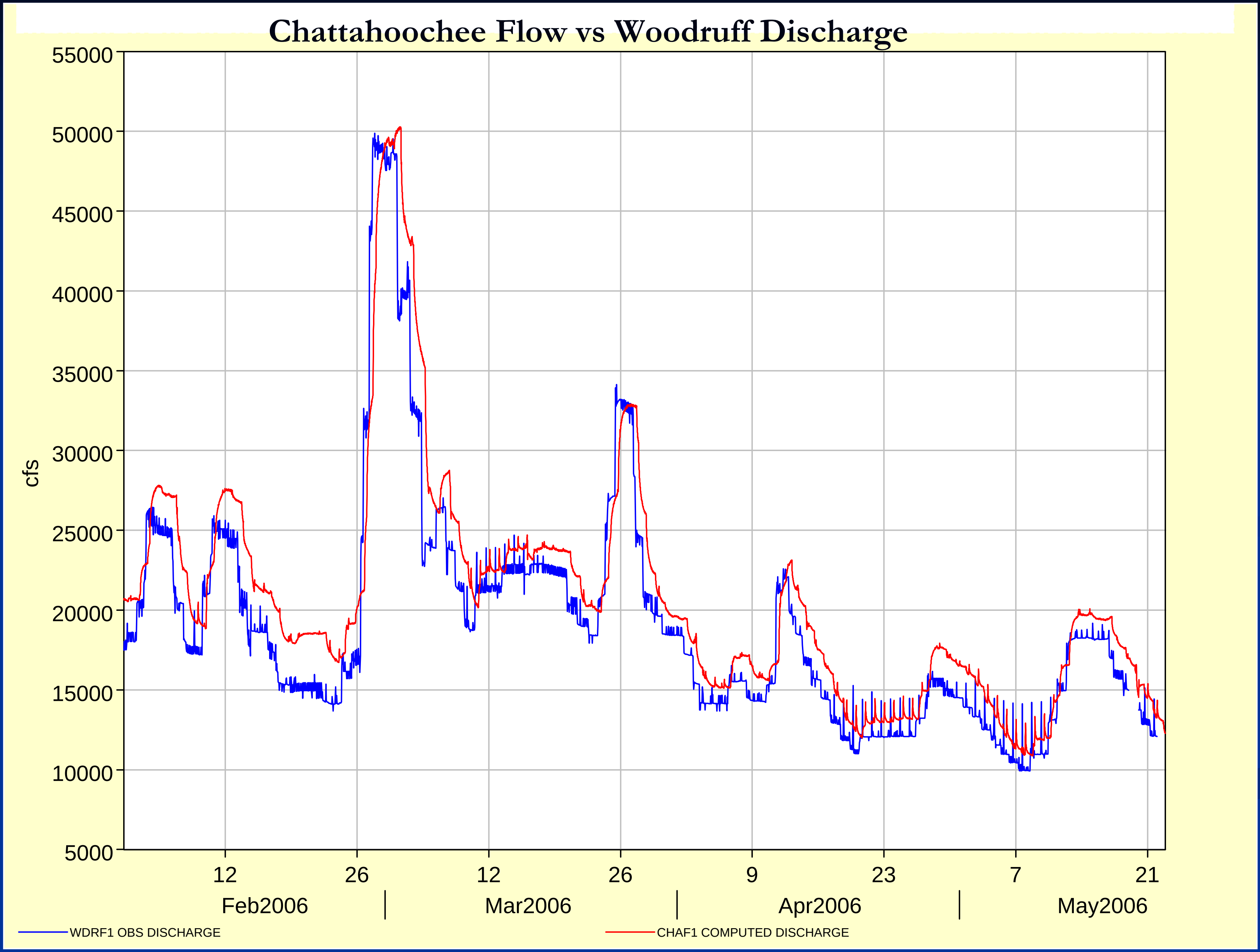
- Routing of Basin Inflows



ACF 3-Day Basin Inflow vs 3-Day Discharge
Flow in CFS
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
1-Mar
8-Mar
15-Mar
22-Mar
29-Mar
5-Apr
12-Apr
19-Apr
26-Apr
3-May
10-May
17-May
24-May
31-May
3-DAY Basin Inflows
Woodruff Discharge


ACF 7-Day Basin Inflow vs 7-Day Discharge
Flow in CFS
45000
40000
35000
30000
25000
20000
15000
10000
5000
1-Mar
8-Mar
15-Mar
22-Mar
29-Mar
5-Apr
12-Apr
19-Apr
26-Apr
3-May
10-May
17-May
24-May
31-May
Woodruff 7-Day Discharge
7-DAY Basin Inflows

- Differences between Woodruff Discharges and Flows at Chattahoochee Gage.
  - Powerhouse turbine releases based on manufacturer discharge ratings
  - Spillway releases are based on computed spillway gate ratings
  - Seepage and other flow occurring beneath dam and underground springs (Avg of about 200 cfs at known river boil)


Chattahoochee Flow vs Woodruff Discharge
cfs
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
12
26
12
26
9
23
7
21
Feb2006
Mar2006
Apr2006
May2006
WDRF1 OBS DISCHARGE
CHAF1 COMPUTED DISCHARGE

- Physical Limitations to the Operation of Woodruff Powerhouse & Spillway to Meet Releases and Rampdown Rates.
- Releasing 70-100% Basin Inflow – Does this provide adequate opportunities to refill the projects?
- Adjustment to the 37,400 cfs and 20,400 cfs thresholds.

PREPARATION OF THE INTERIM OPERATIONS MODEL IN STELLA

By: Steve Leitman

Damayan Water Project

The program used to simulate the interim operations was STELLA. I used “Florida’s” version of this model, the version which I developed and which was used during the Comprehensive Study and modified during the Allocation Formula negotiations.

This is essentially the same version of the model which was reviewed extensively by modeling teams of the three states many years ago when we were attempting to negotiate an Allocation Formula

My work on this project was funded through a non-profit organization and at this time I am neither under contract with the State of Florida or the U.S. Fish and Wildlife Service.

I am going to review the basic input settings for the model and Jerry Ziewitz, USFWS will then review how the model was modified to represent the proposed interim operations.

I am also willing to share with anyone a set of Excel spreadsheets I use to both summarize the input settings of a model run and to analyze model output.

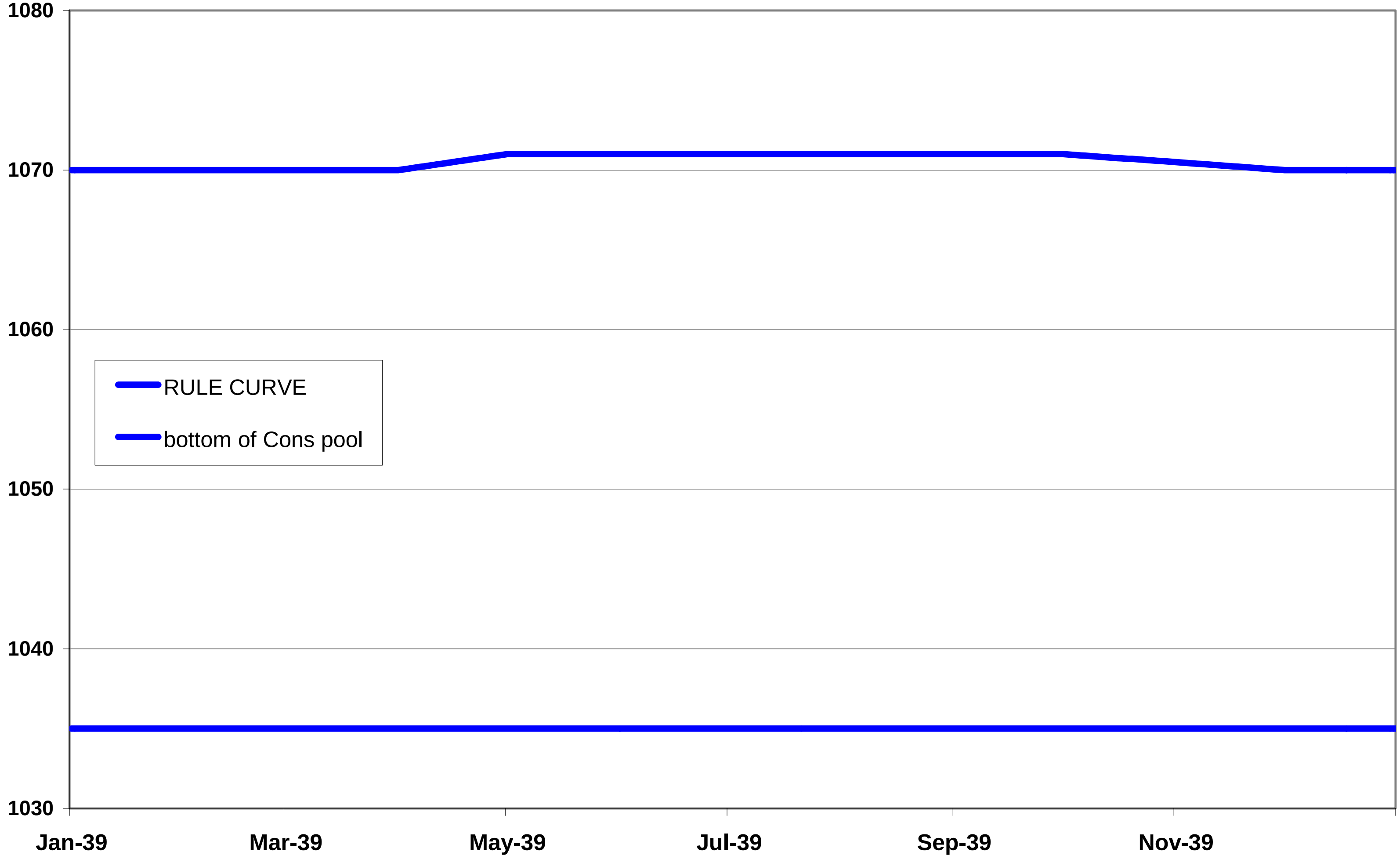
Copies of the model can be provided to anyone requesting them, although you must have your own version of STELLA to view the model.

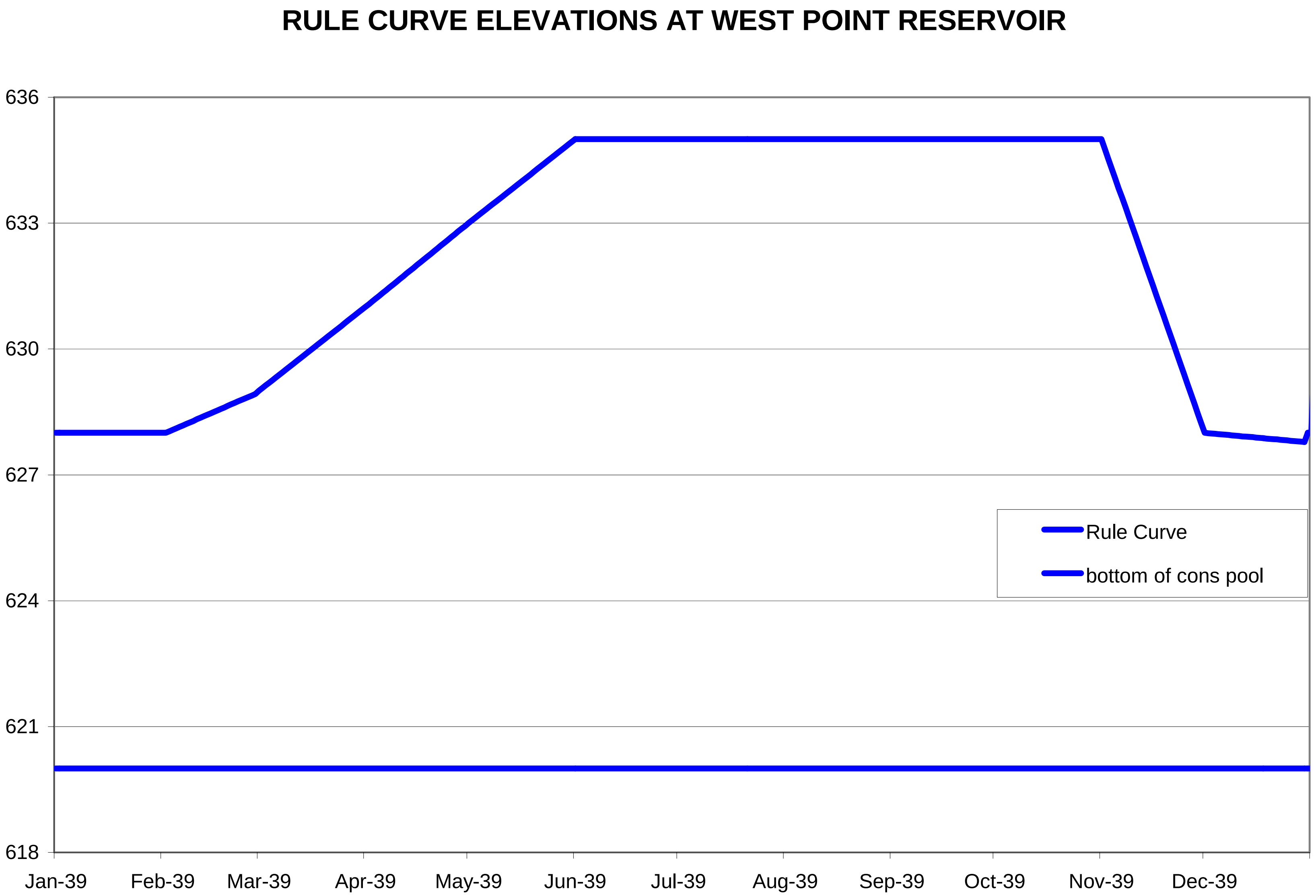
At the root of the model is the same unimpaired flow set developed by the Corps of Engineers and the three states, which is the identical unimpaired flow set used in HEC-5.

The basic reservoir operations in the model is a rule curve approach to operations. In other words, the zone approach, which is included in the current water control plan, is not followed.

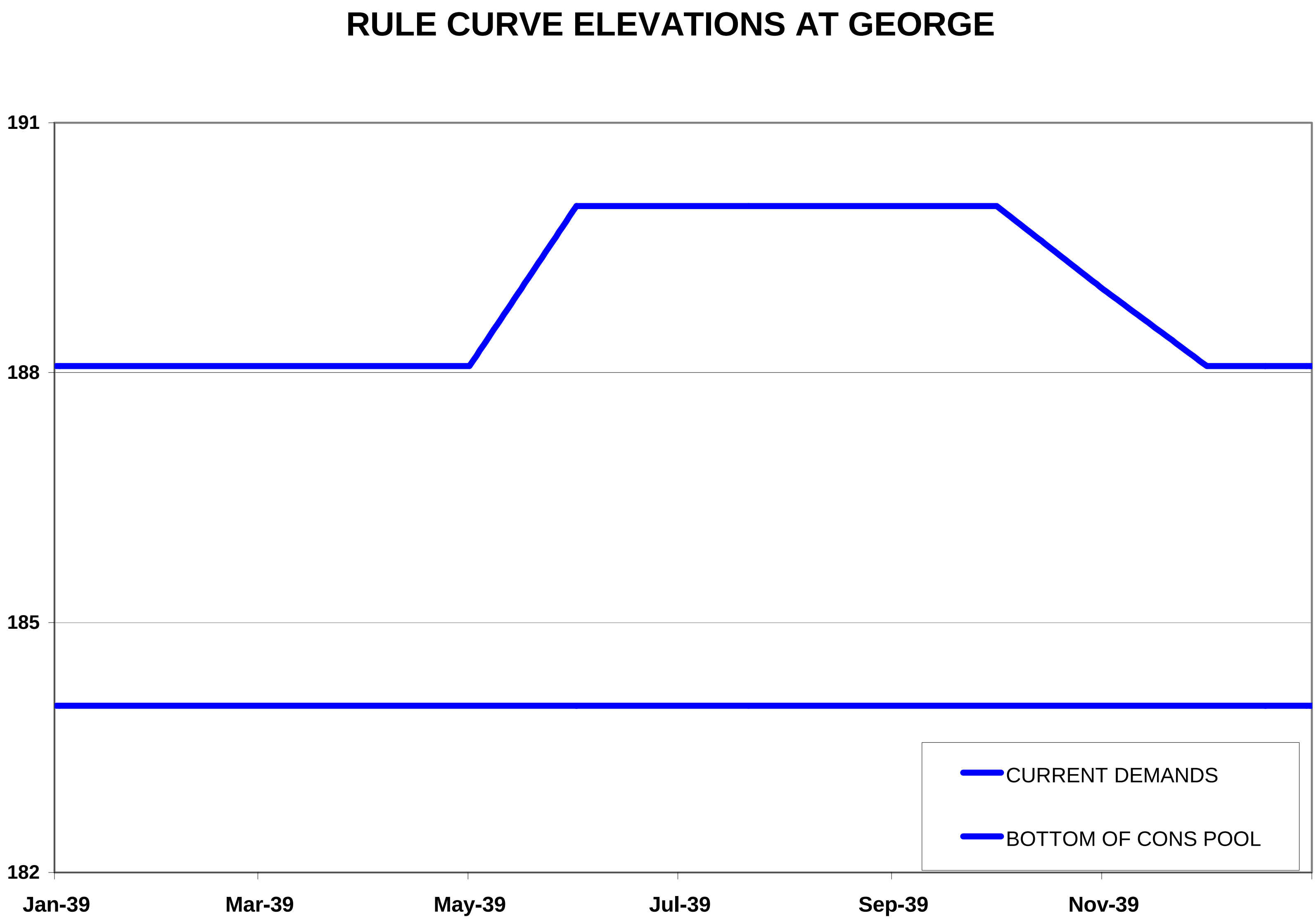
The one exception to this approach is hydropower, for which releases are made consistent with the requirements of the Water Control Plan at the same zone levels and hours of release called for by the WCP.

LAKE LANIER: RULE CURVE AND BOTTOM OF CONSERVATION POOL





RULE CURVE ELEVATIONS AT WEST POINT RESERVOIR
636
633
630
627
624
621
618
Jan-39
Feb-39
Mar-39
Apr-39
May-39
Jun-39
Jul-39
Aug-39
Sep-39
Oct-39
Nov-39
Dec-39
Rule Curve
bottom of cons pool


RULE CURVE ELEVATIONS AT GEORGE
191
188
185
182
Jan-39
Mar-39
May-39
Jul-39
Sep-39
Nov-39
CURRENT DEMANDS
BOTTOM OF CONS POOL

No specific releases are made to support the federal navigation project.

The demand set used in the model evaluations is the 2000 forecasted demands with releases for the metro Atlanta region modified to represent the averages of what occurred between 1998 and 2001.

withdrawal

	BUFORD	PTC	W'BURG	TOTAL
Jan	98.6	294.2	25.9	418.7
Feb	94.9	290.8	26.0	411.7
March	104.0	292.1	27.0	423.1
April	119.1	312.0	28.6	459.7
May	134.7	360.5	29.9	525.1
June	133.8	363.9	29.3	527.0
July	139.9	382.8	28.2	550.9
August	141.2	374.5	30.1	545.8
Sept	139.6	347.6	29.6	516.8
Oct	125.4	334.2	28.1	487.7
Nov	116.3	314.9	27.6	458.8
Dec	105.2	293.9	26.5	425.6
annual avg	121.1	330.1	28.1	479.2

return

	BUFORD	PTC	W'BURG	TOTAL
Jan	12.7	29.9	213.7	256.3
Feb	12.6	29.9	213.1	255.6
March	12.4	29.5	213.0	254.9
April	12.3	29.6	212.4	254.3
May	12.4	28.4	208.6	249.4
June	12.3	28.0	211.4	251.7
July	12.3	28.9	206.7	247.9
August	12.1	29.2	205.4	246.7
Sept	11.7	29.8	209.8	251.3
Oct	11.9	28.6	198.6	239.1
Nov	11.5	29.2	206.4	247.1
Dec	11.3	31.5	202.4	245.2
annual avg	12.1	29.4	208.5	250.0

The acreage value used for Flint agricultural withdrawals was 621,000 acres and the dry year multiplier was set at 1.2. Using these values resulted in flows in the Flint during the 1999-2001 drought that were comparable to gauged flows.

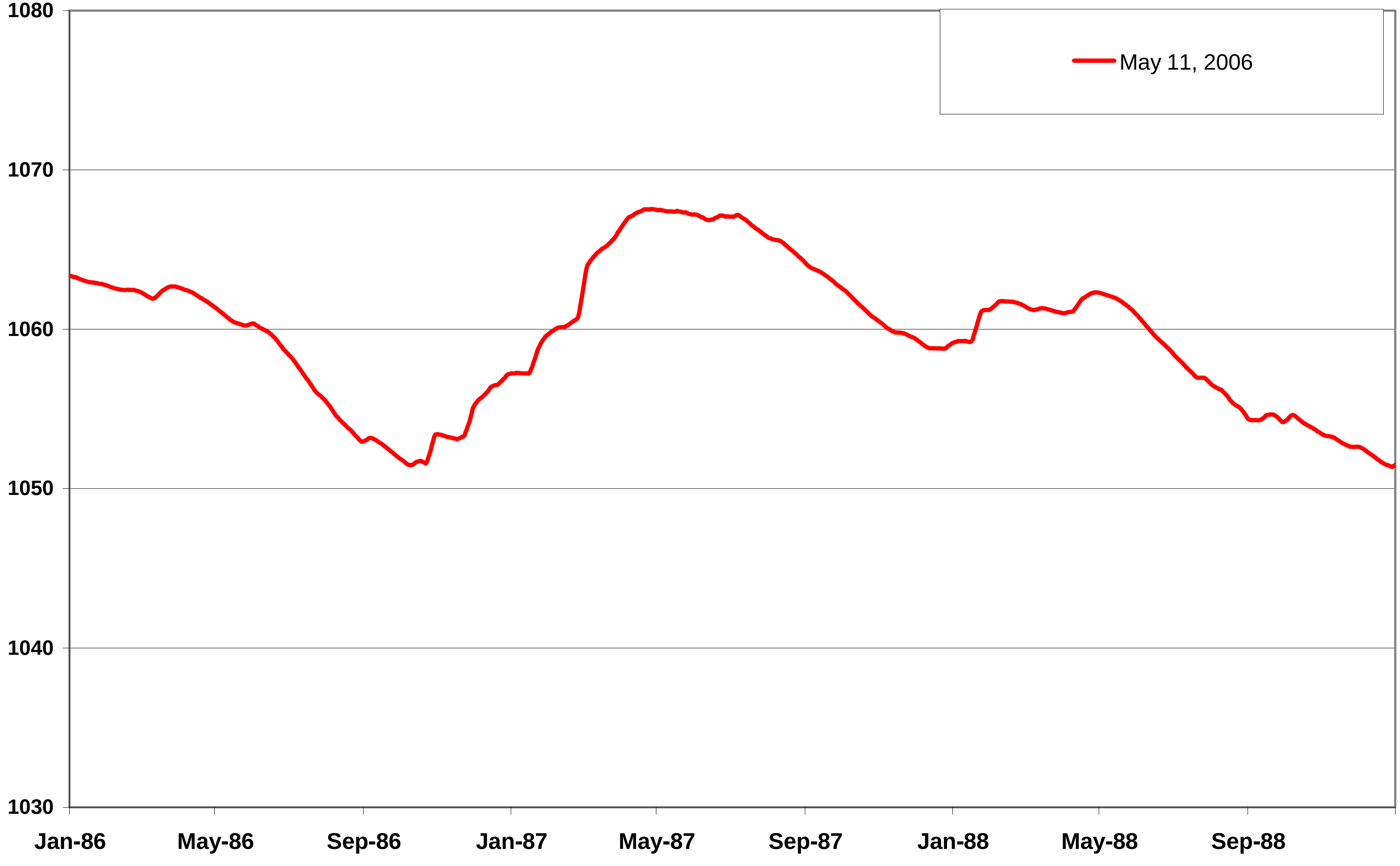
The minimum flow target at Peachtree Creek was set at 750 cfs daily average flow.

SUMMARY OF ACF OUTPUT

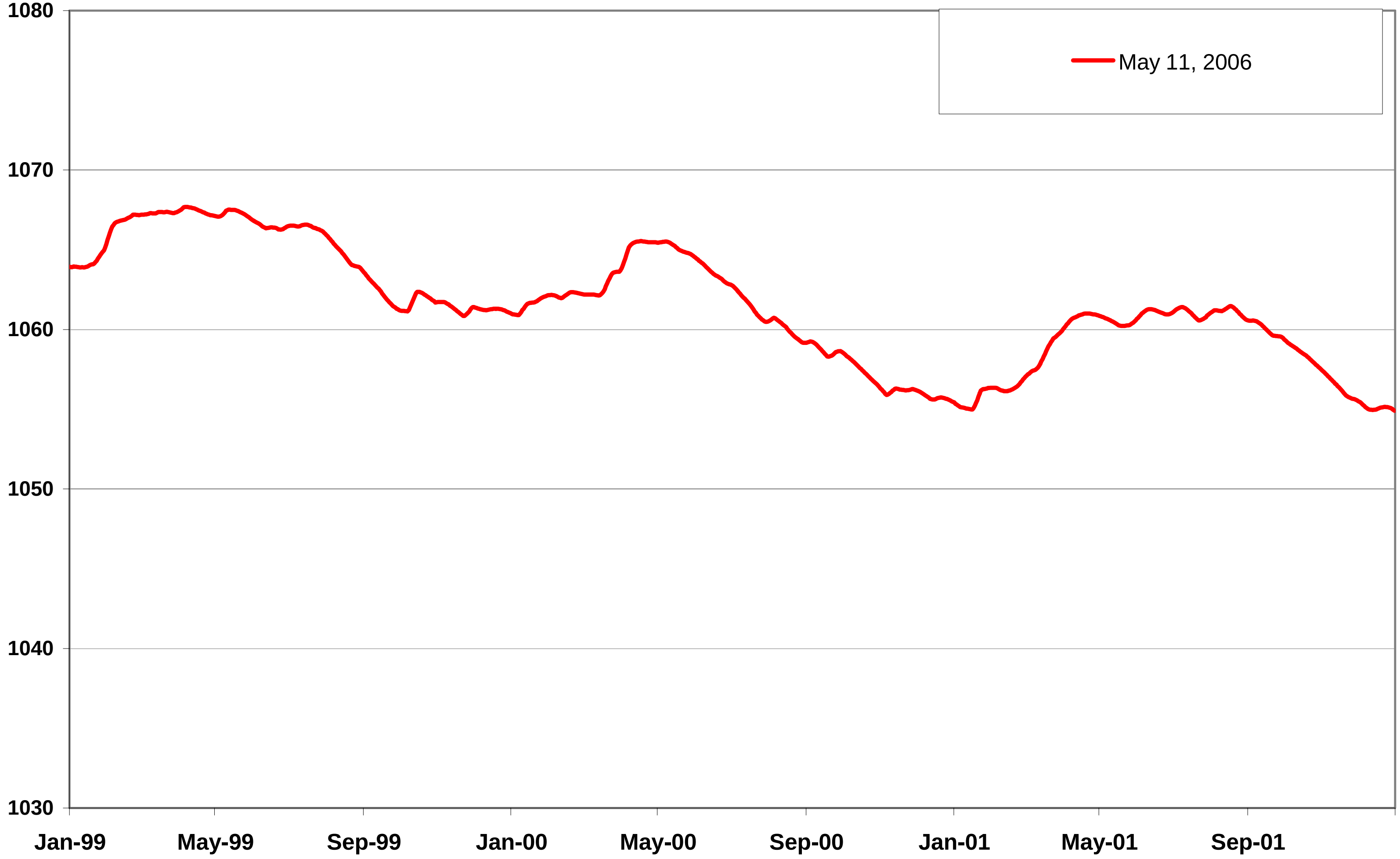
MAY 11, 2006

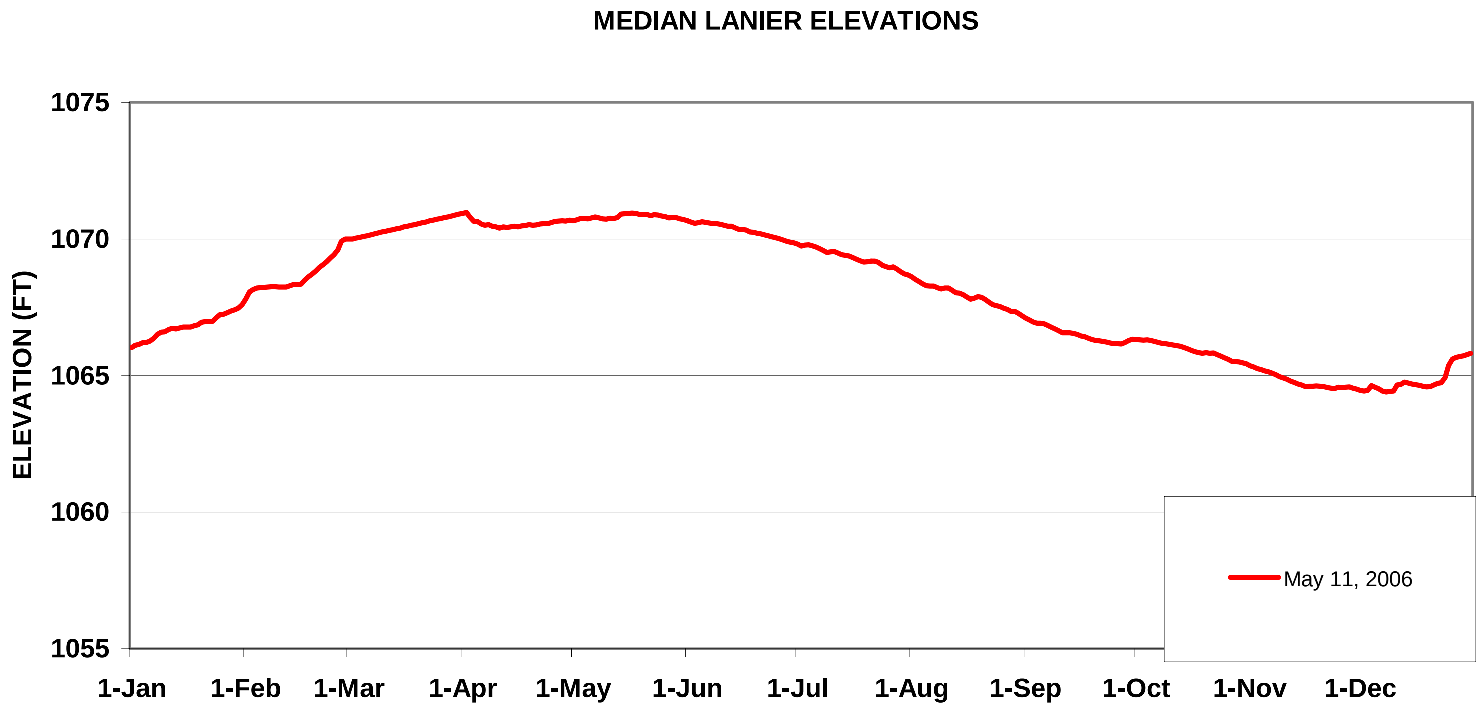
LANIER

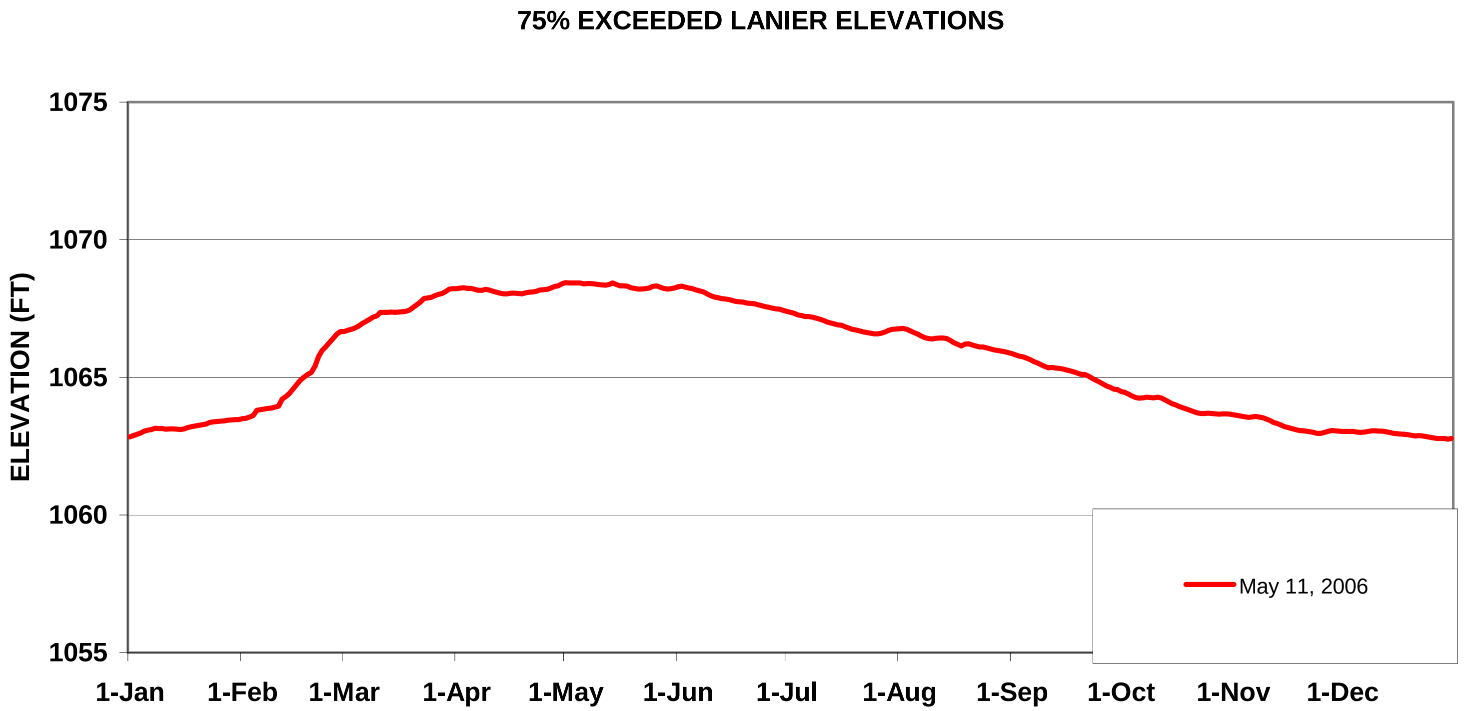
DAILY TIME SERIES OF ELEVATIONS AT LAKE LANIER
1986-1988



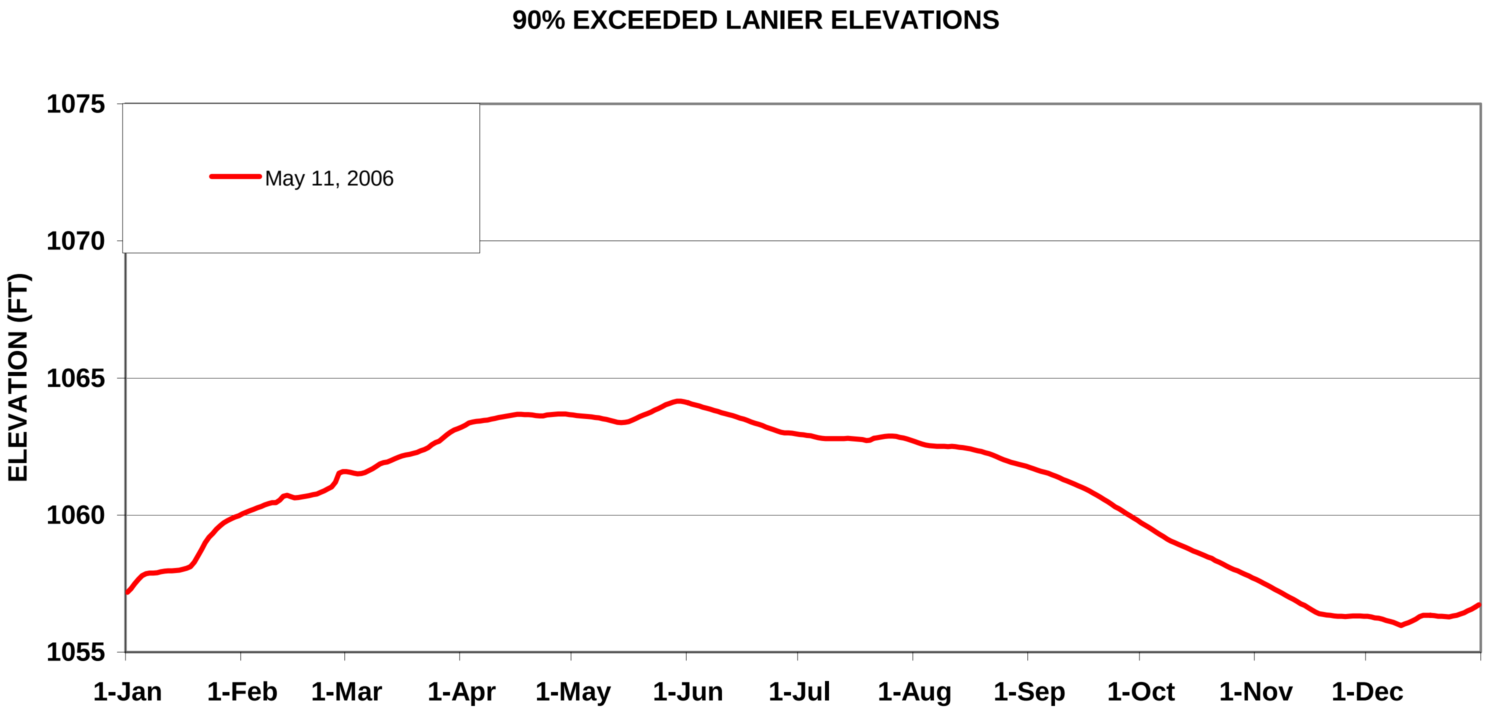
DAILY TIME SERIES OF ELEVATIONS AT LAKE LANIER
1999-2001

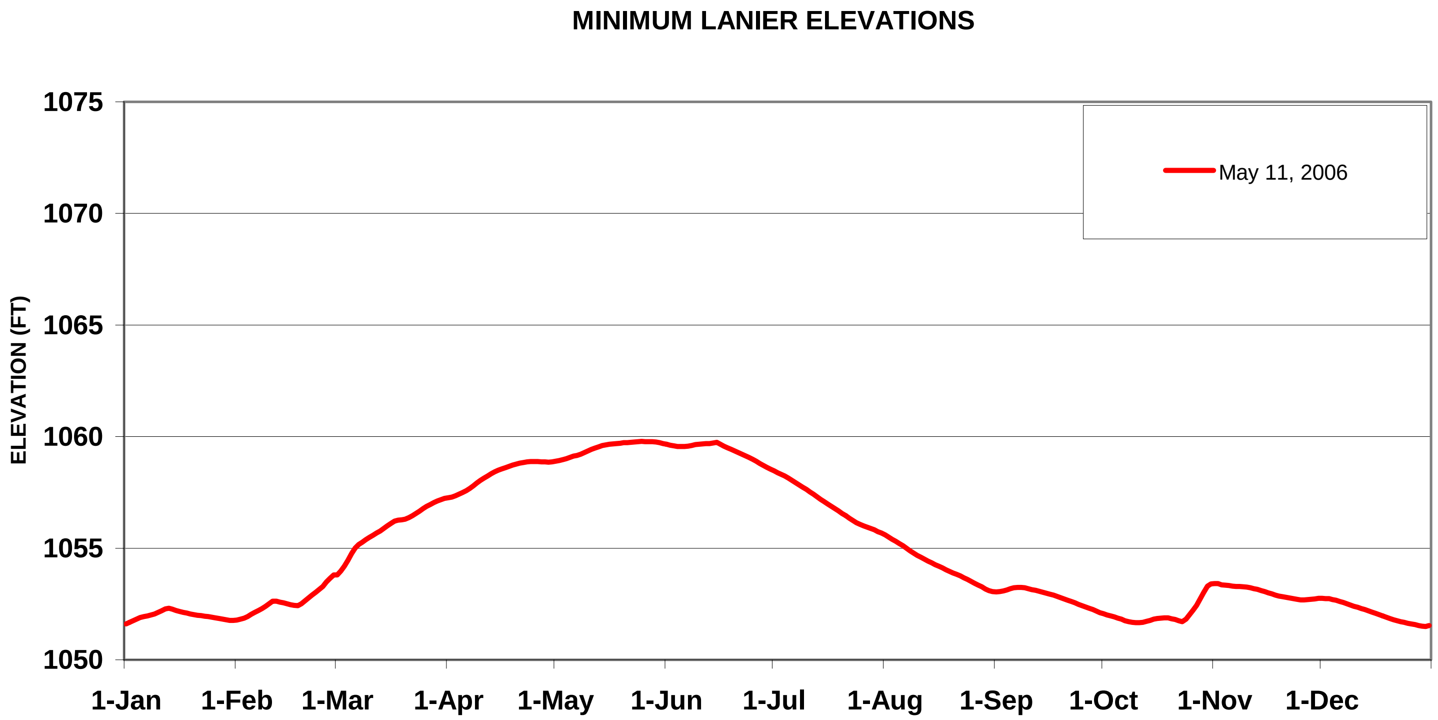



MEDIAN LANIER ELEVATIONS
ELEVATION (FT)
1075
1070
1065
1060
1055
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006



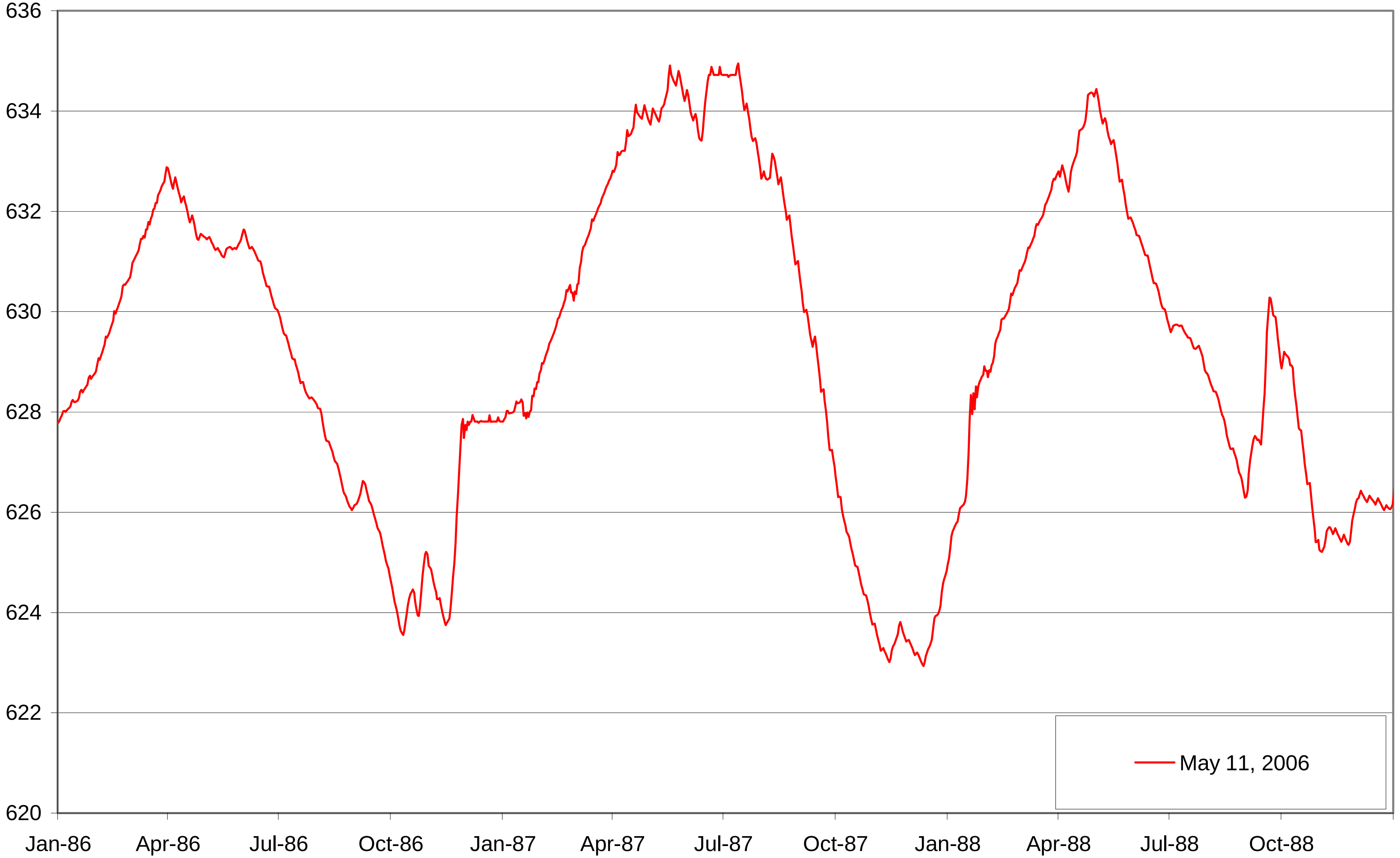
75% EXCEEDED LANIER ELEVATIONS
ELEVATION (FT)
1075
1070
1065
1060
1055
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006

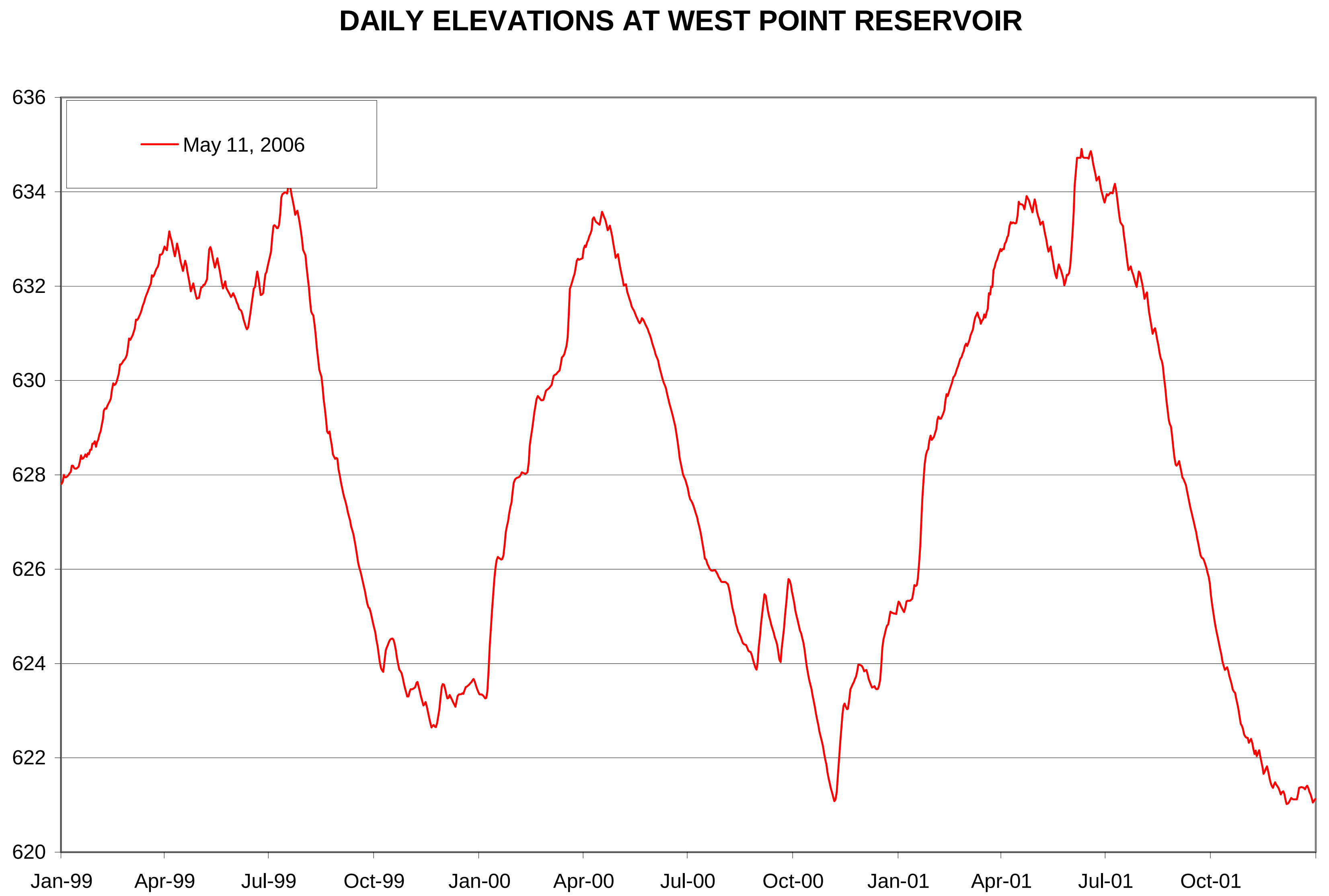

90% EXCEEDED LANIER ELEVATIONS
ELEVATION (FT)
1075
1070
1065
1060
1055
May 11, 2006
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec


MINIMUM LANIER ELEVATIONS
ELEVATION (FT)
1075
1070
1065
1060
1055
1050
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006

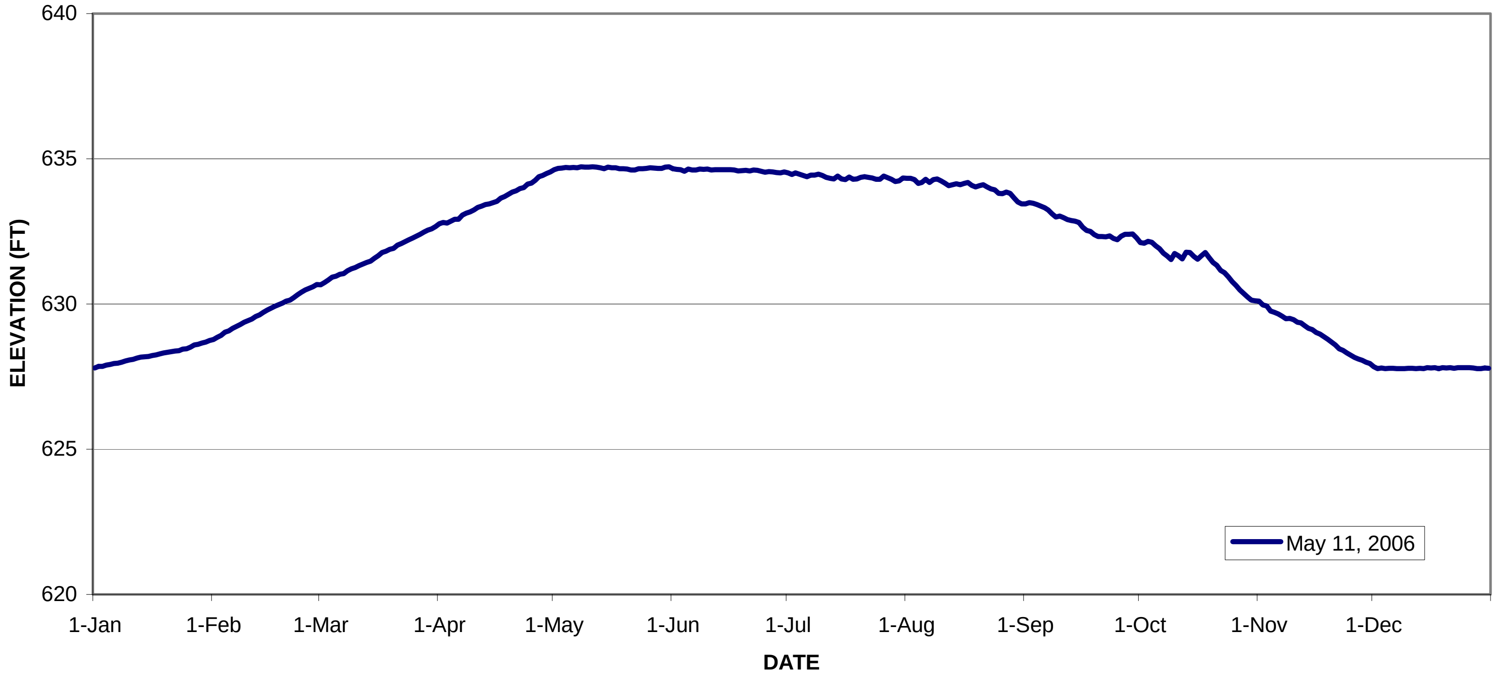
WEST POINT

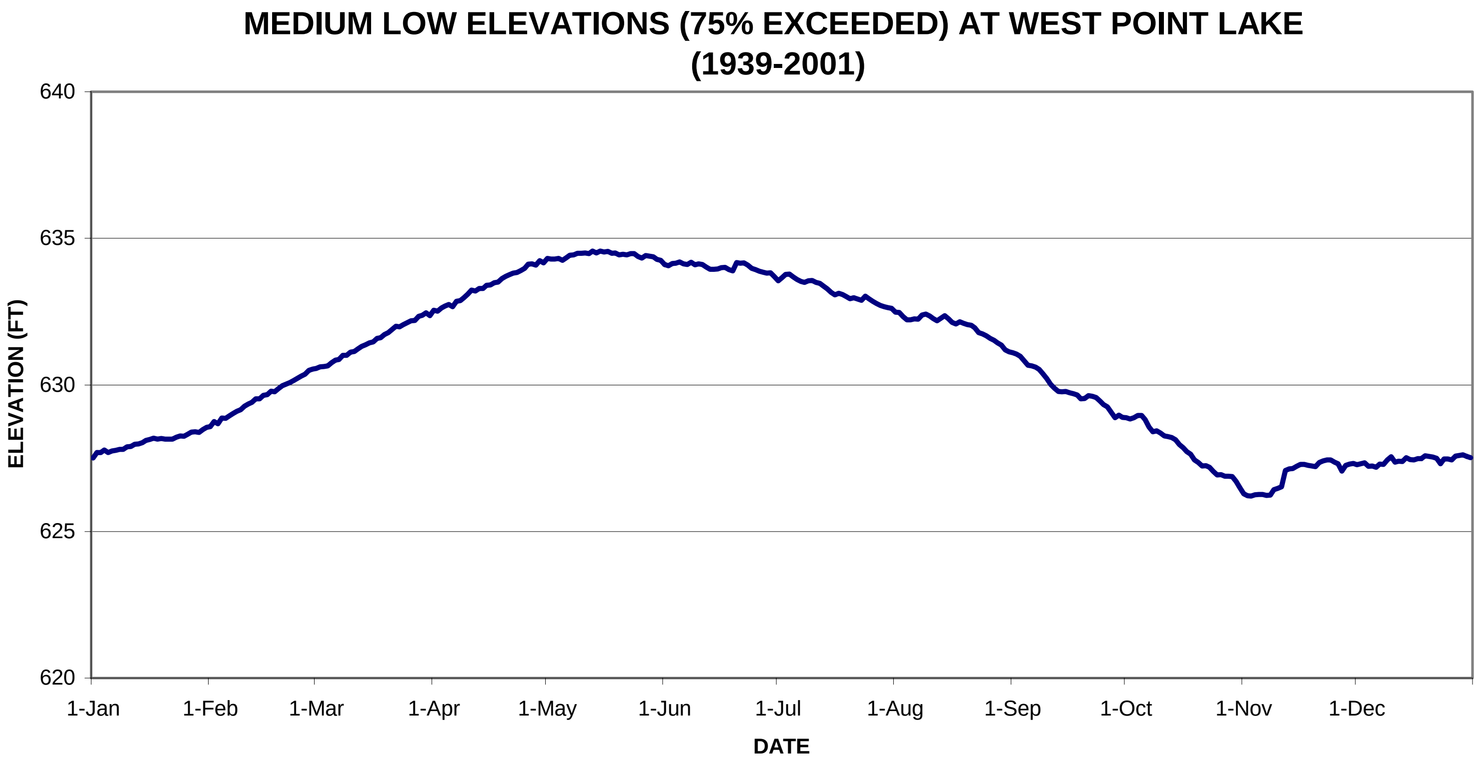
DAILY ELEVATIONS AT WEST POINT RESERVOIR



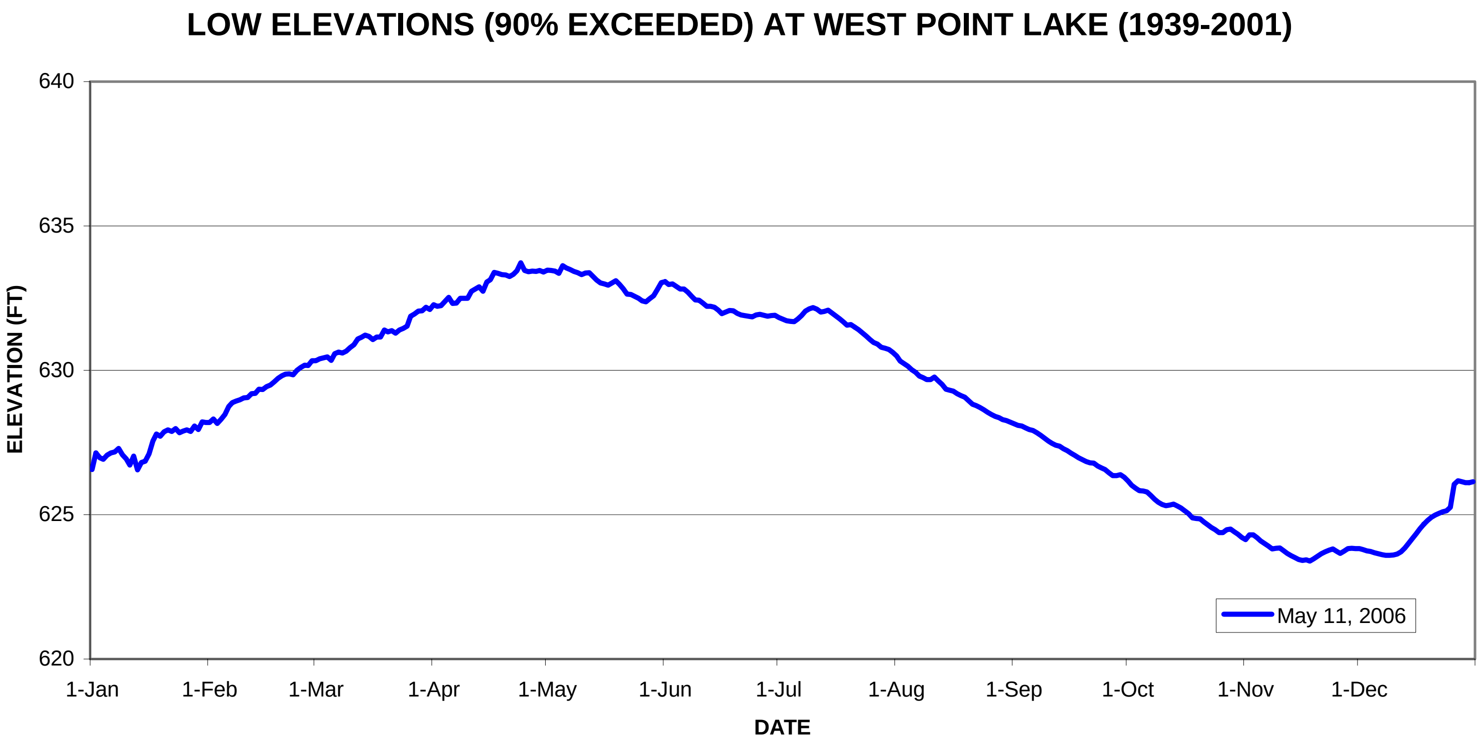

DAILY ELEVATIONS AT WEST POINT RESERVOIR
May 11, 2006
636
634
632
630
628
626
624
622
620
Jan-99
Apr-99
Jul-99
Oct-99
Jan-00
Apr-00
Jul-00
Oct-00
Jan-01
Apr-01
Jul-01
Oct-01

MEDIAN ELEVATION AT WEST POINT LAKE (1939-2001)



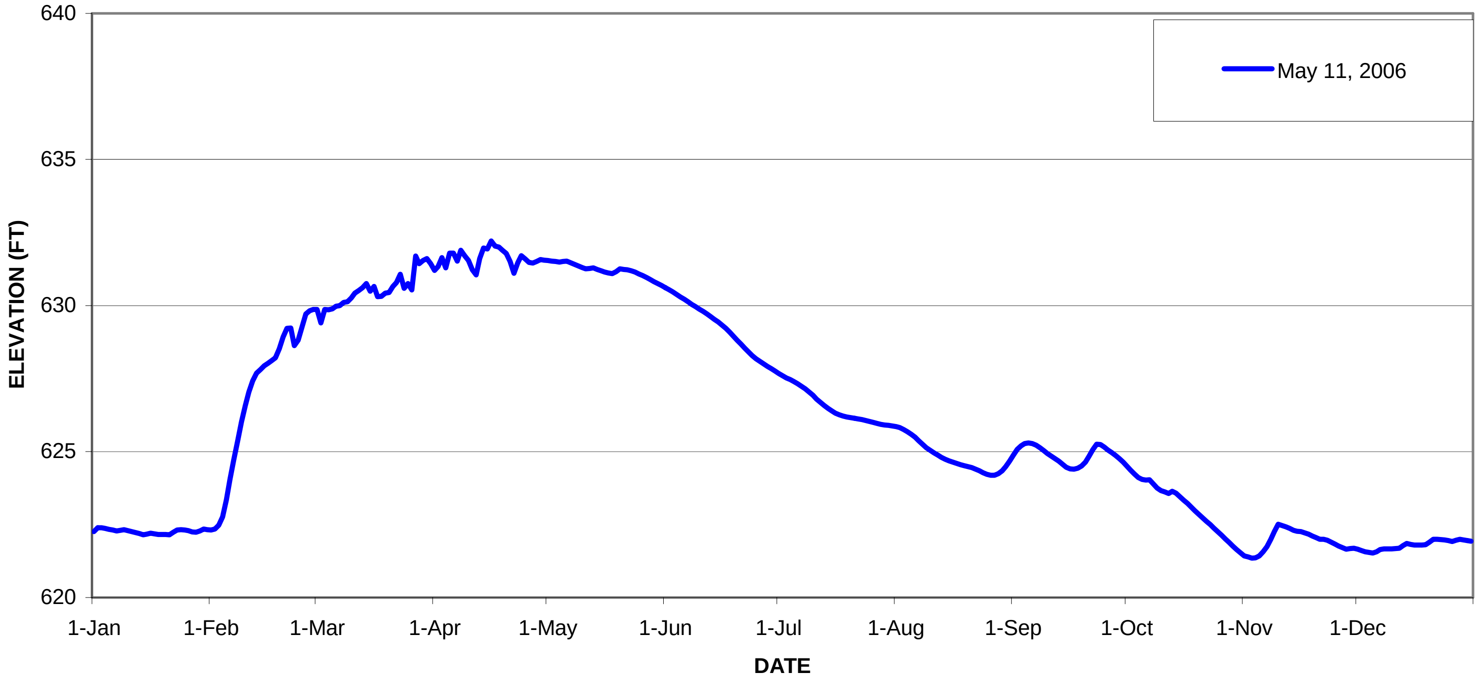


MEDIUM LOW ELEVATIONS (75% EXCEEDED) AT WEST POINT LAKE
(1939-2001)
640
635
630
625
620
ELEVATION (FT)
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
DATE



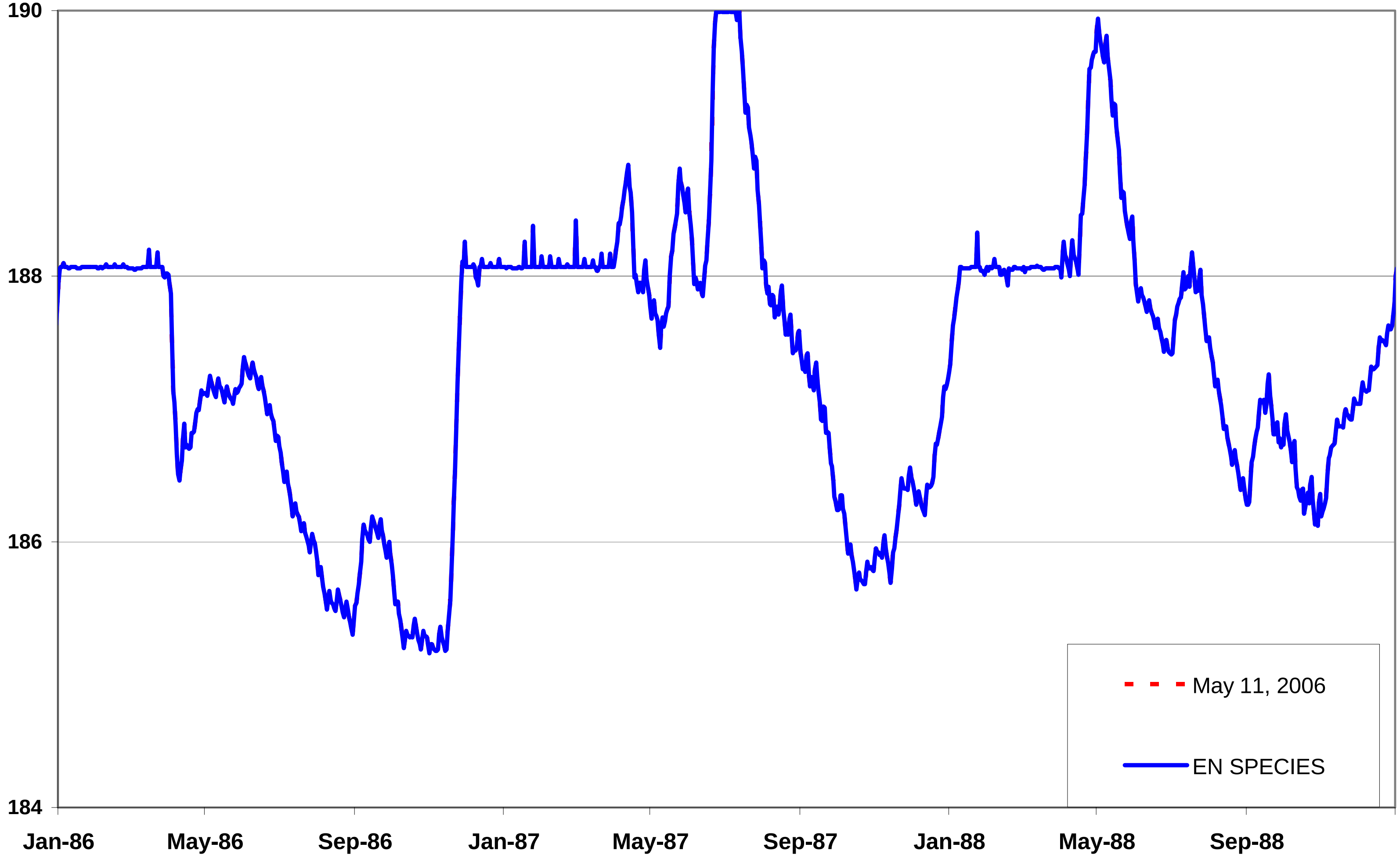
LOW ELEVATIONS (90% EXCEEDED) AT WEST POINT LAKE (1939-2001)
640
635
630
625
620
ELEVATION (FT)
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
DATE
May 11, 2006

MINIMUM ELEVATIONS AT WEST POINT

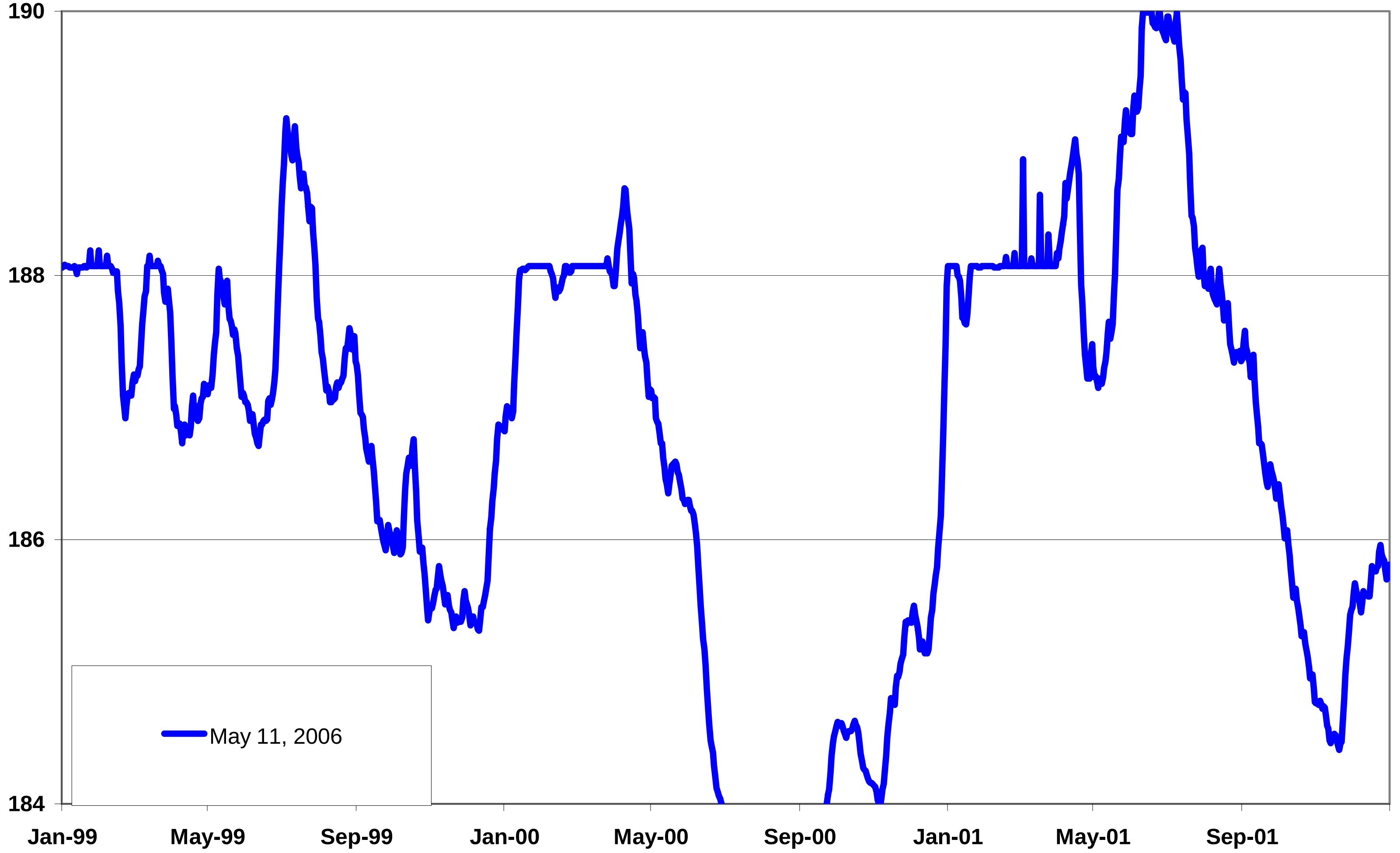


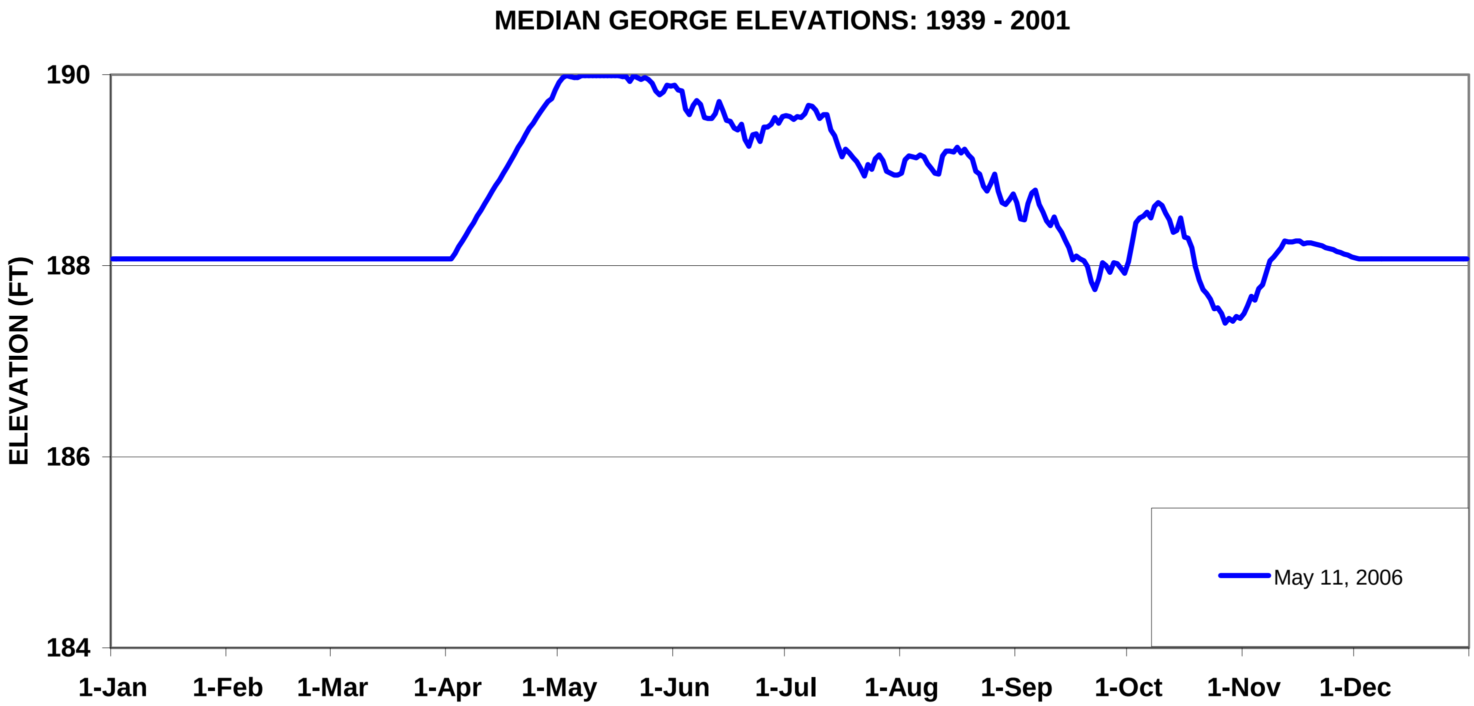
W.F. GEORGE

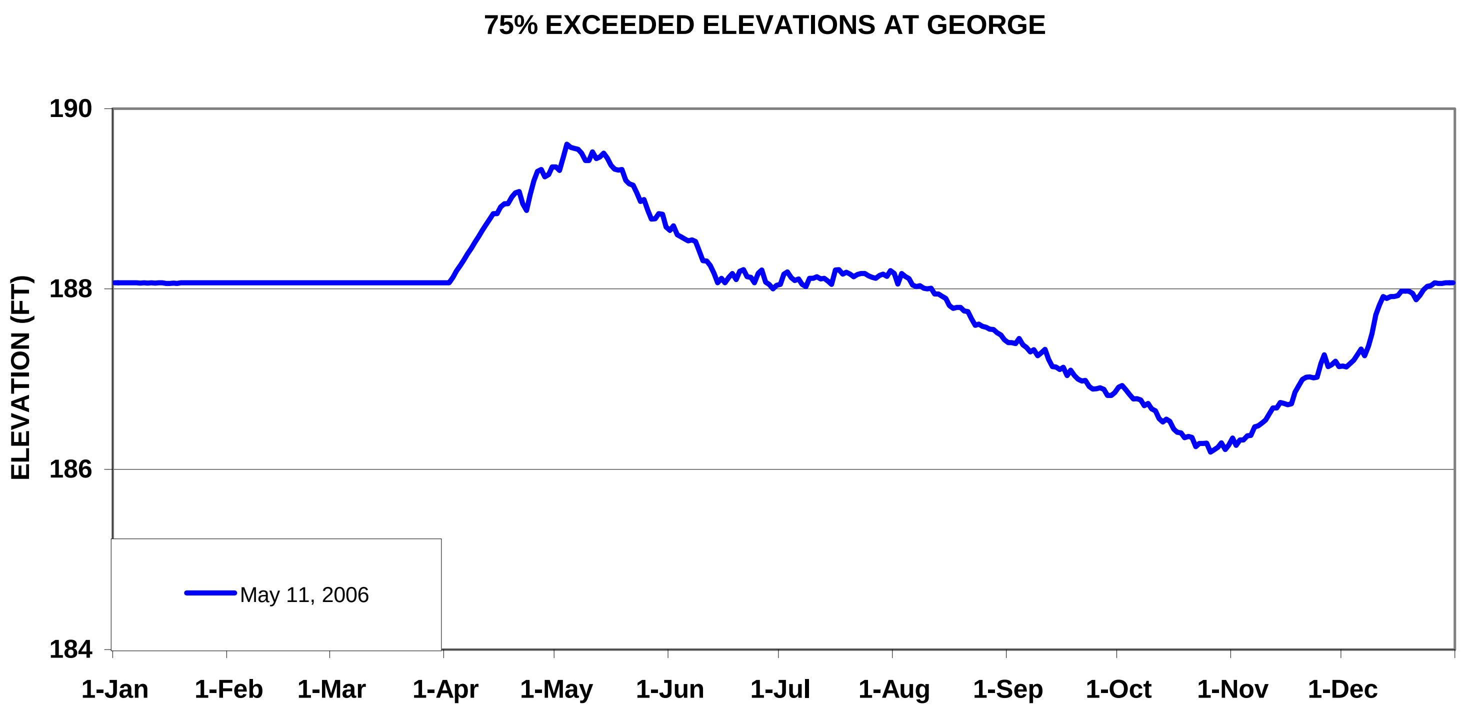
DAILY TIME SERIES OF ELEVATIONS AT GEORGE 1986-1988

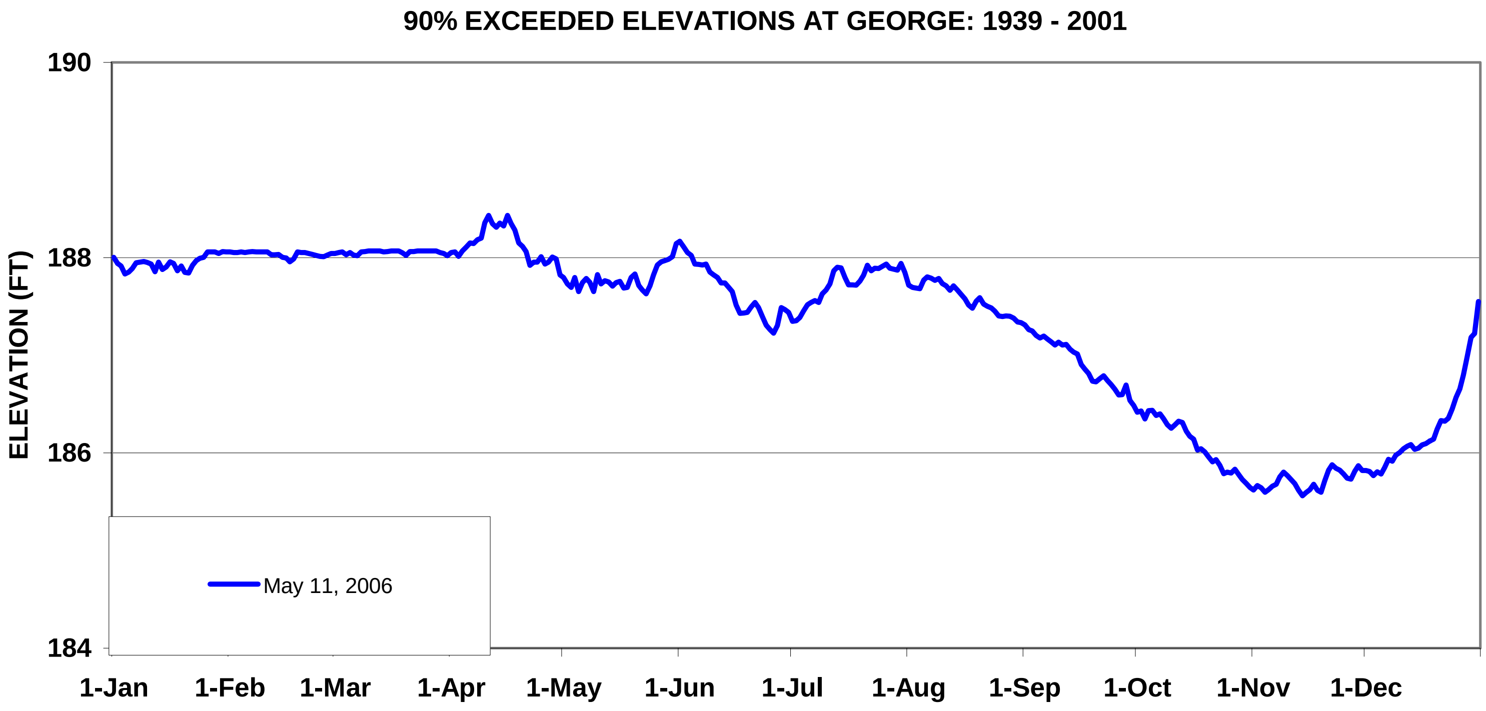


DAILY TIME SERIES OF ELEVATIONS AT GEORGE 1999 - 2001

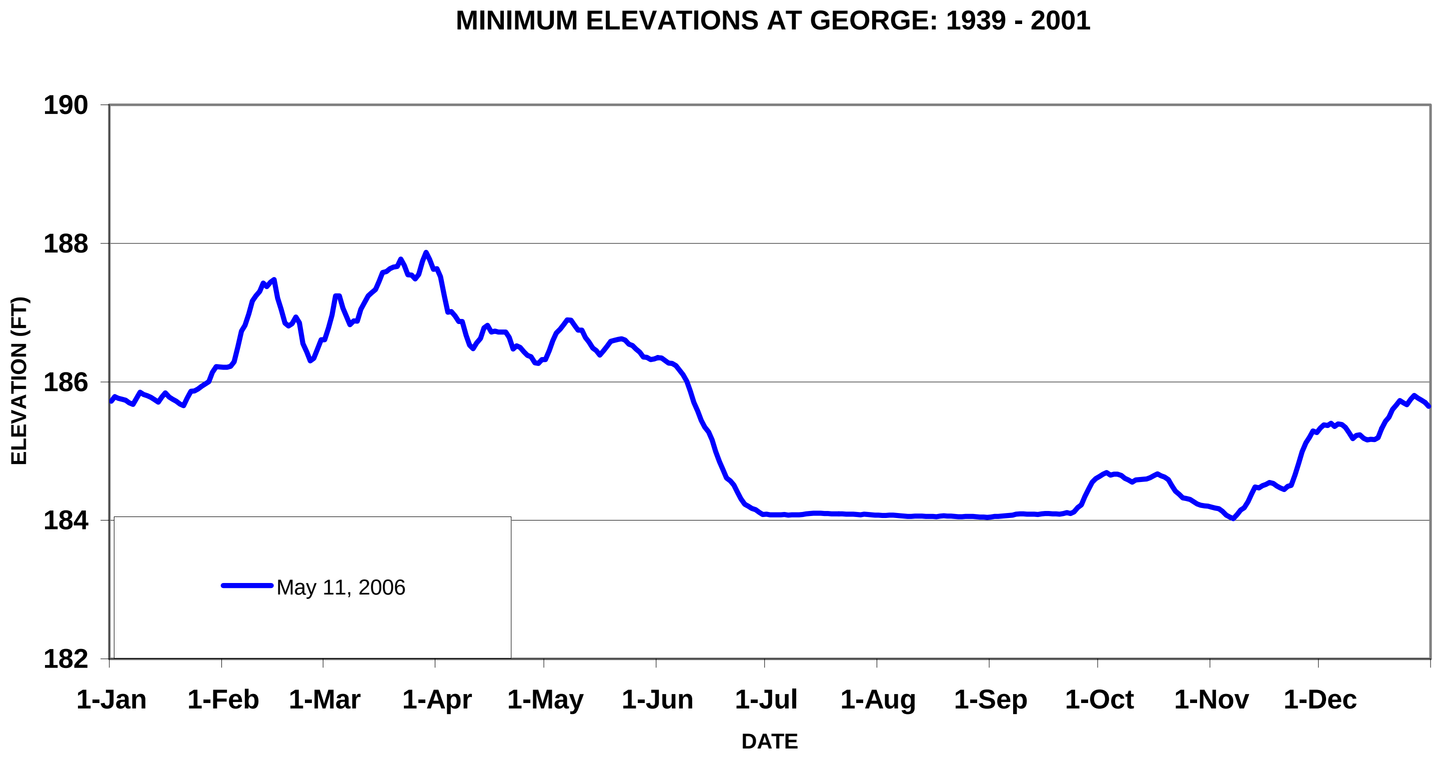



MEDIAN GEORGE ELEVATIONS: 1939 - 2001
ELEVATION (FT)
190
188
186
184
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006


75% EXCEEDED ELEVATIONS AT GEORGE
ELEVATION (FT)
190
188
186
184
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006

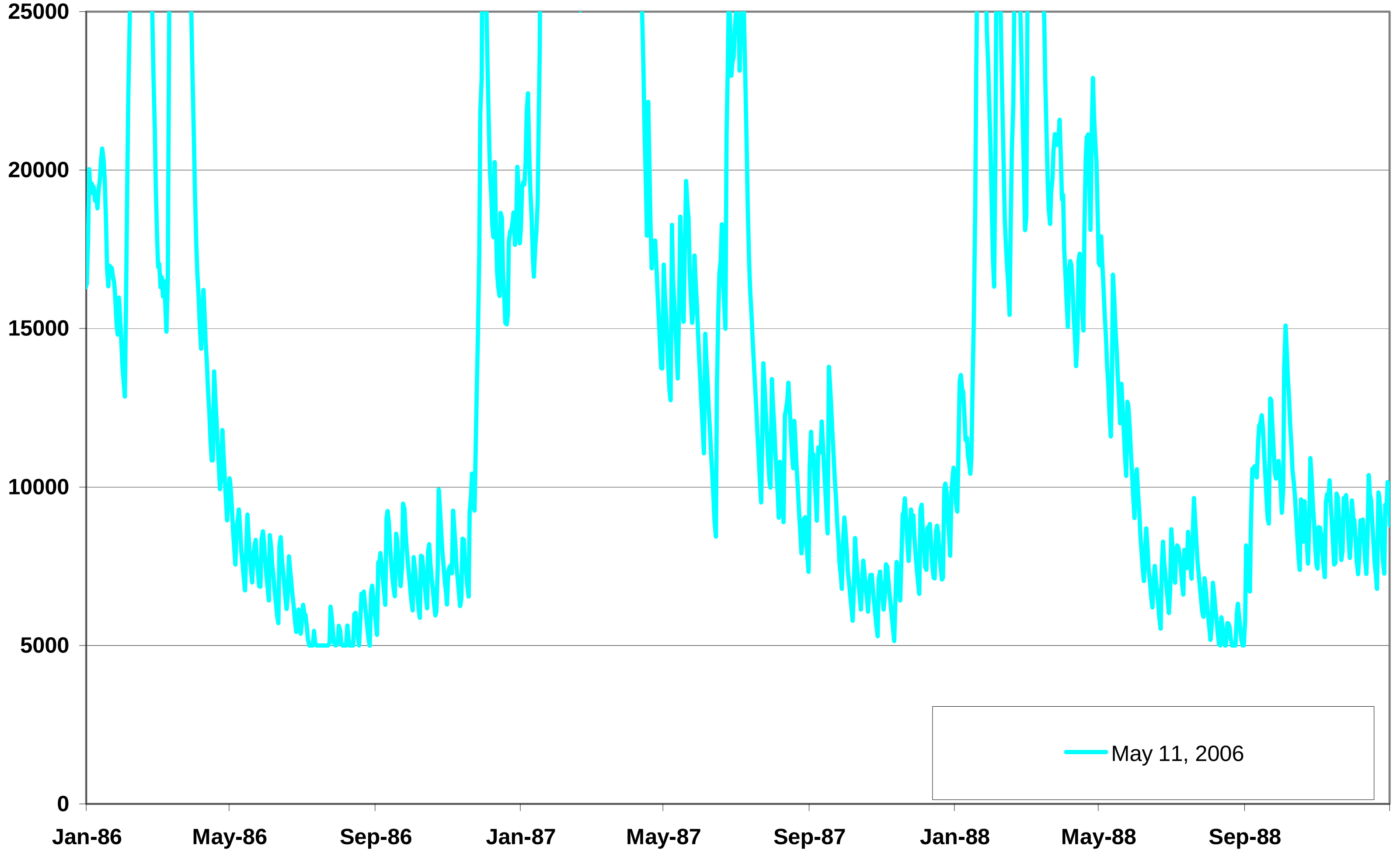


90% EXCEEDED ELEVATIONS AT GEORGE: 1939 - 2001
ELEVATION (FT)
190
188
186
184
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006

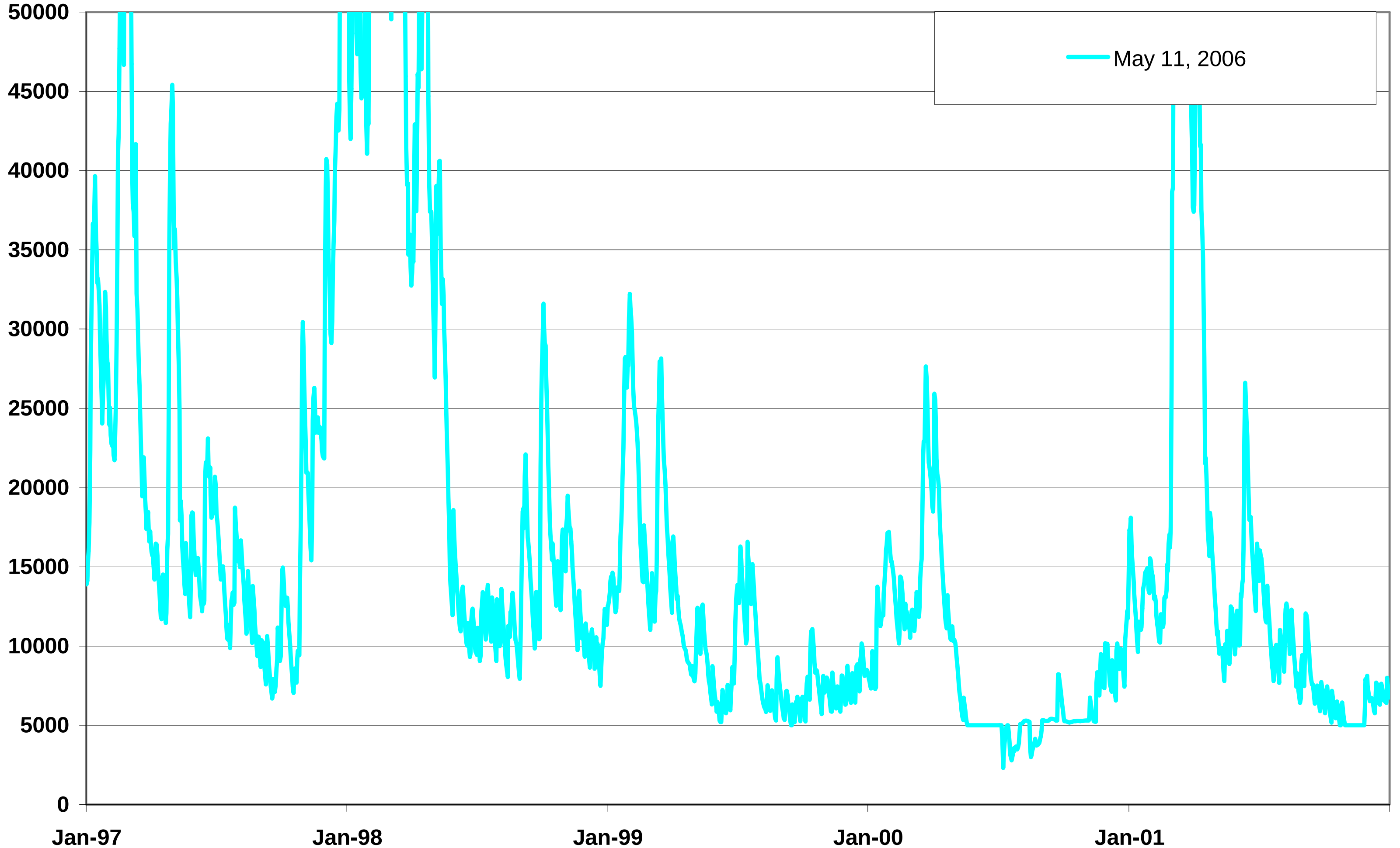

MINIMUM ELEVATIONS AT GEORGE: 1939 - 2001
190
188
186
184
182
ELEVATION (FT)
May 11, 2006
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
DATE

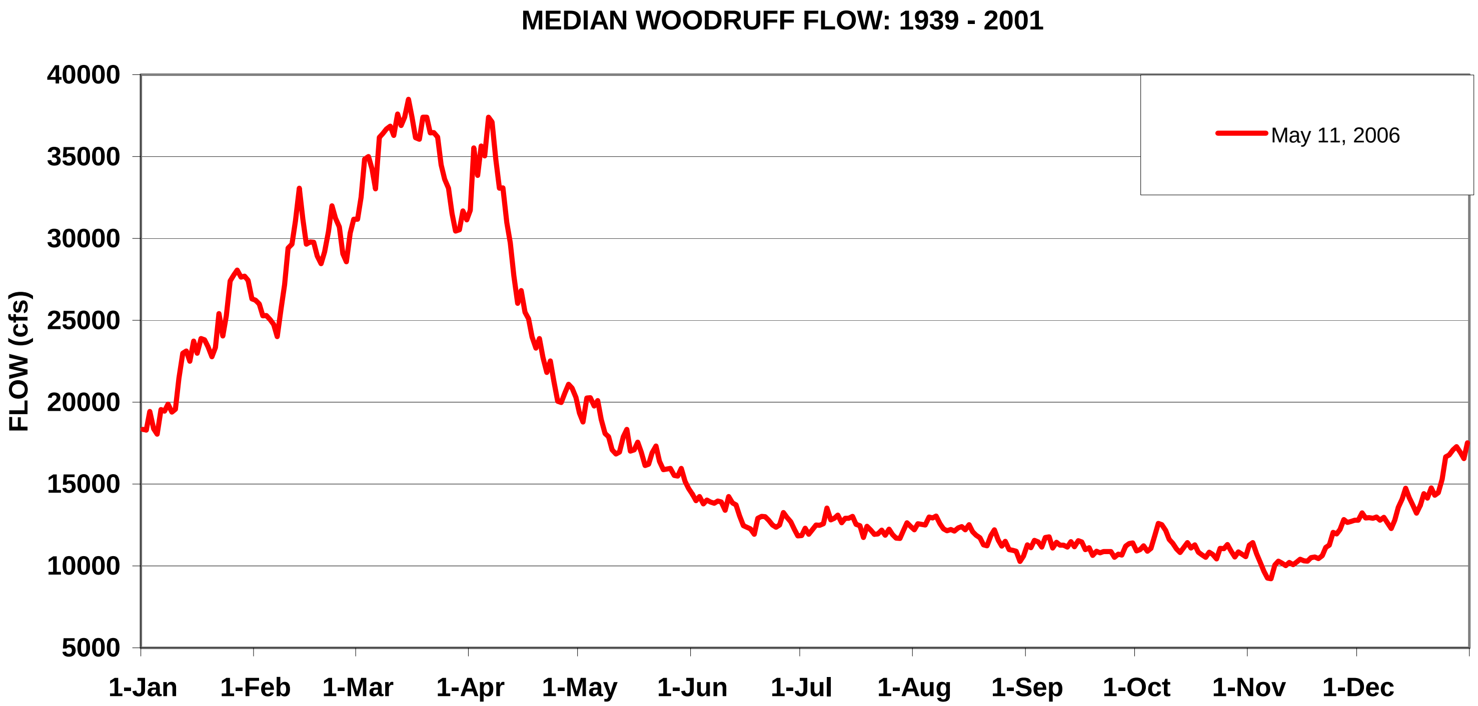
WOODRUFF OUTFLOWS

DAILY TIME SERIES OF FLOWS AT WOODRUFF
1986-1988

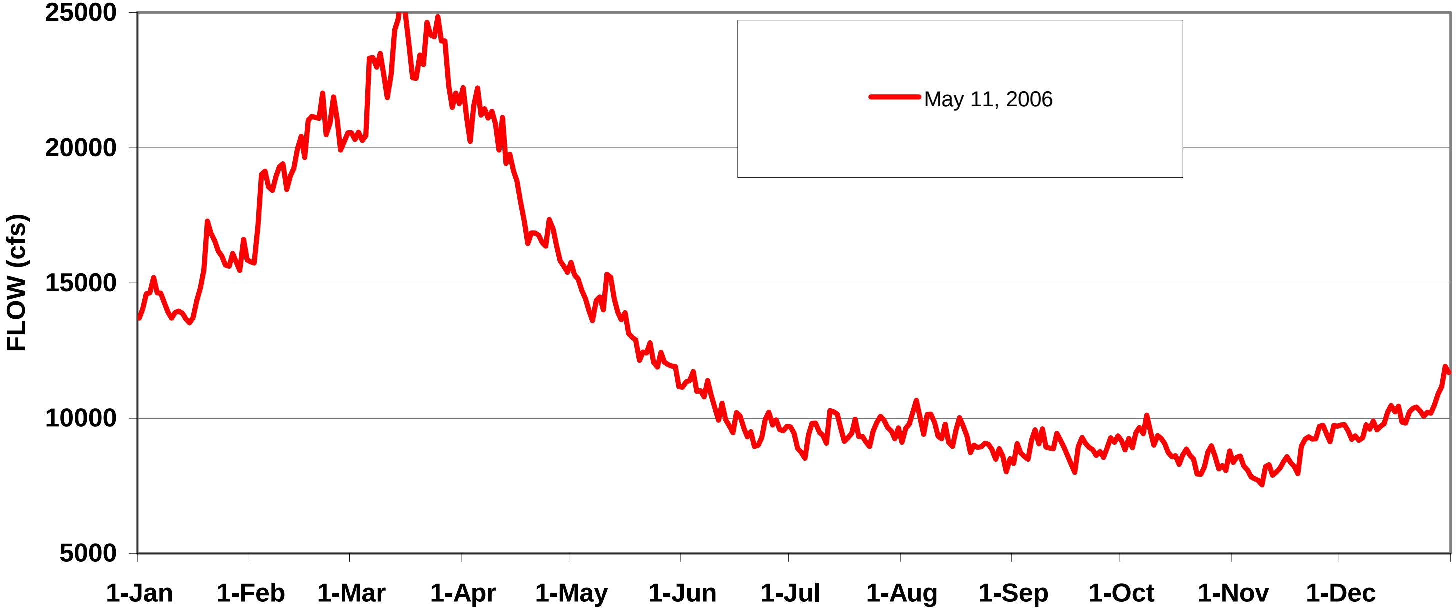


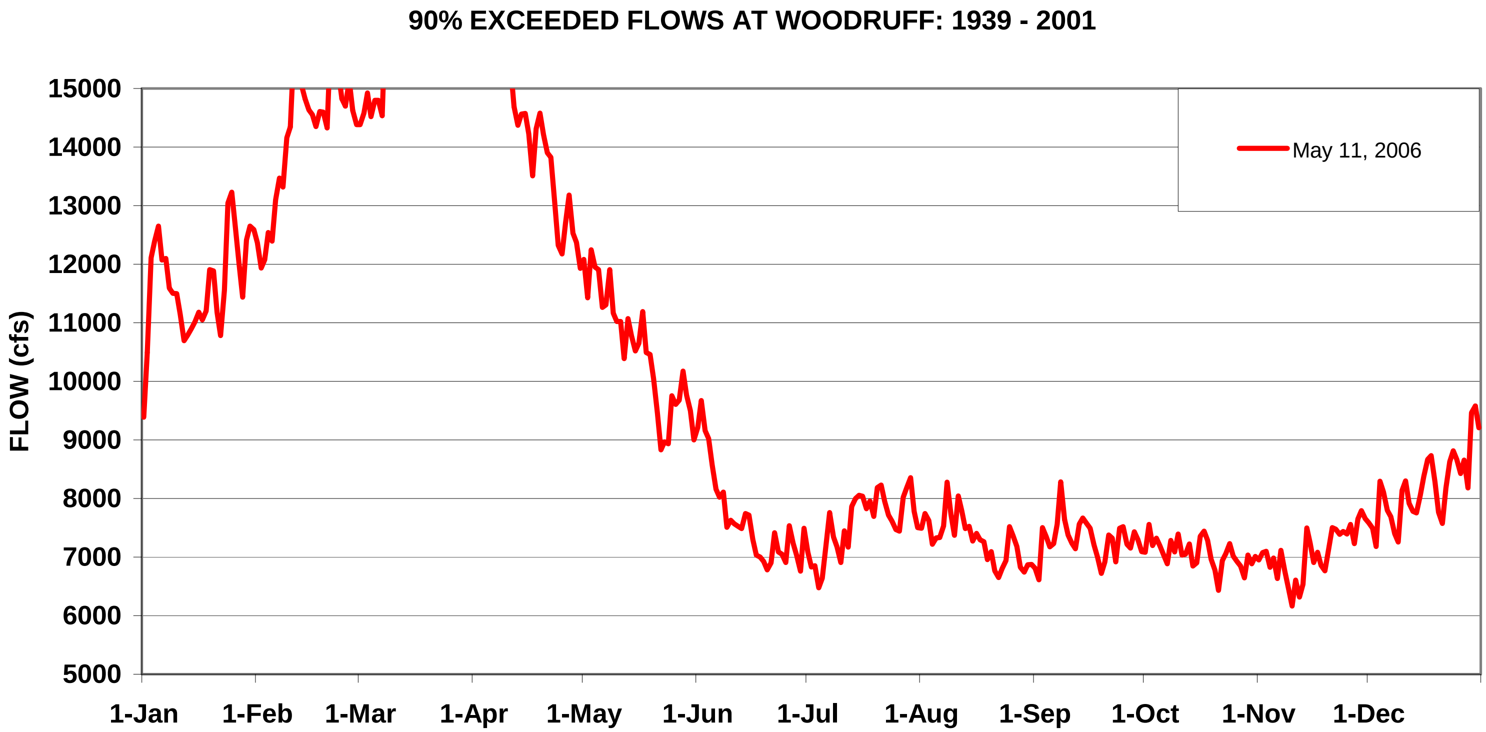
DAILY TIME SERIES OF FLOWS AT WOODRUFF
1995 - 1999



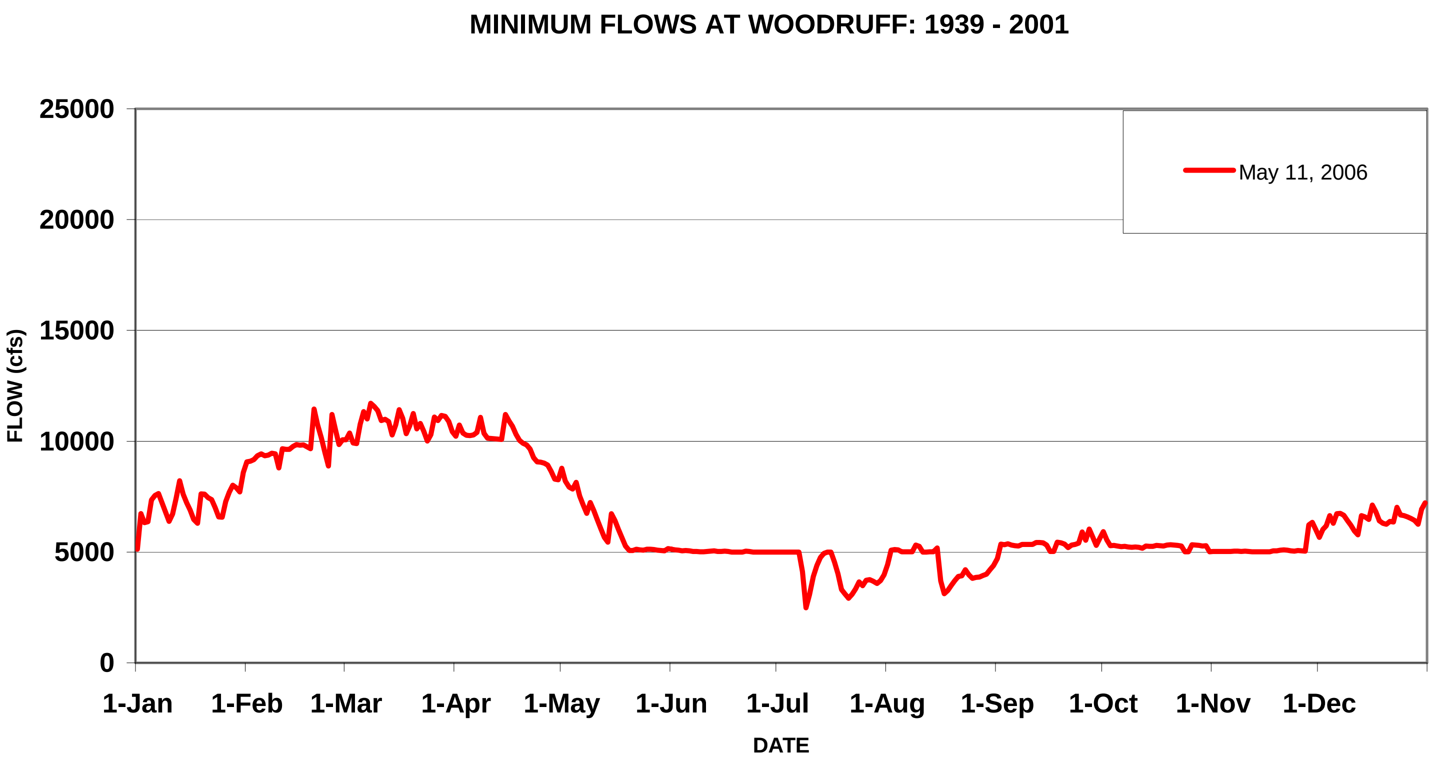

MEDIAN WOODRUFF FLOW: 1939 - 2001
FLOW (cfs)
40000
35000
30000
25000
20000
15000
10000
5000
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006

75% EXCEEDED FLOW AT WOODRUFF





90% EXCEEDED FLOWS AT WOODRUFF: 1939 - 2001
FLOW (cfs)
15000
14000
13000
12000
11000
10000
9000
8000
7000
6000
5000
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
May 11, 2006



MINIMUM FLOWS AT WOODRUFF: 1939 - 2001
25000
20000
15000
10000
5000
0
FLOW (cfs)
May 11, 2006
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec
DATE

Hydrological Model of Interim Operations

- Need a hydrologic representation of the Corps’ action submitted for formal consultation March 7, 2006.
- FWS will use model output as basis of analysis for determining effects to listed species and their habitat relative to an “environmental baseline”.

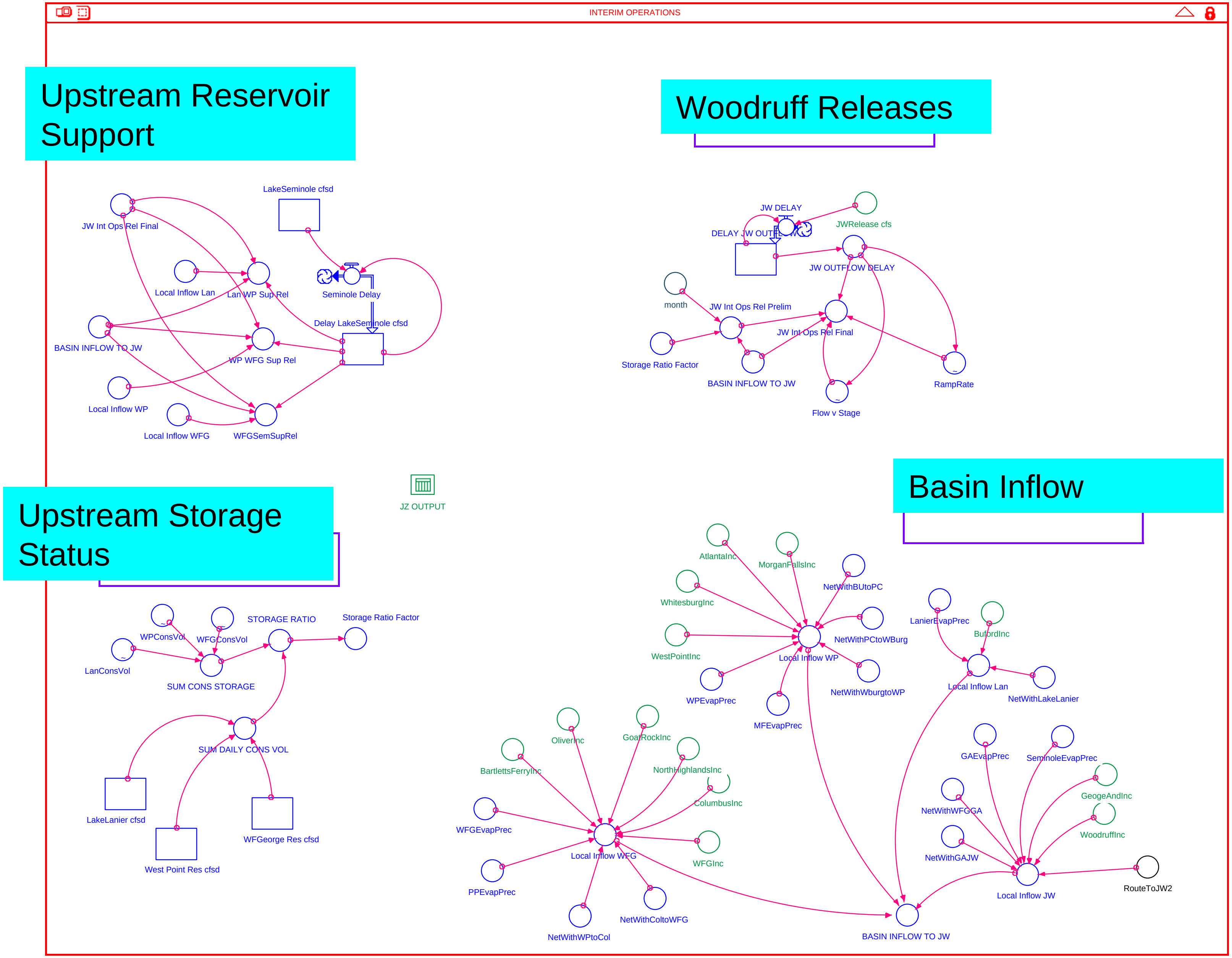
Environmental Baseline

- A “snapshot” of a listed species’ status in the action area.
- Does not include the effects of the action under review.
- Does include the effects of past operation of an ongoing project.
- Historic flow = the hydrologic part of baseline. We will also estimate a “no action” flow regime to isolate the effects of reservoir operations from other effects to the flow regime.

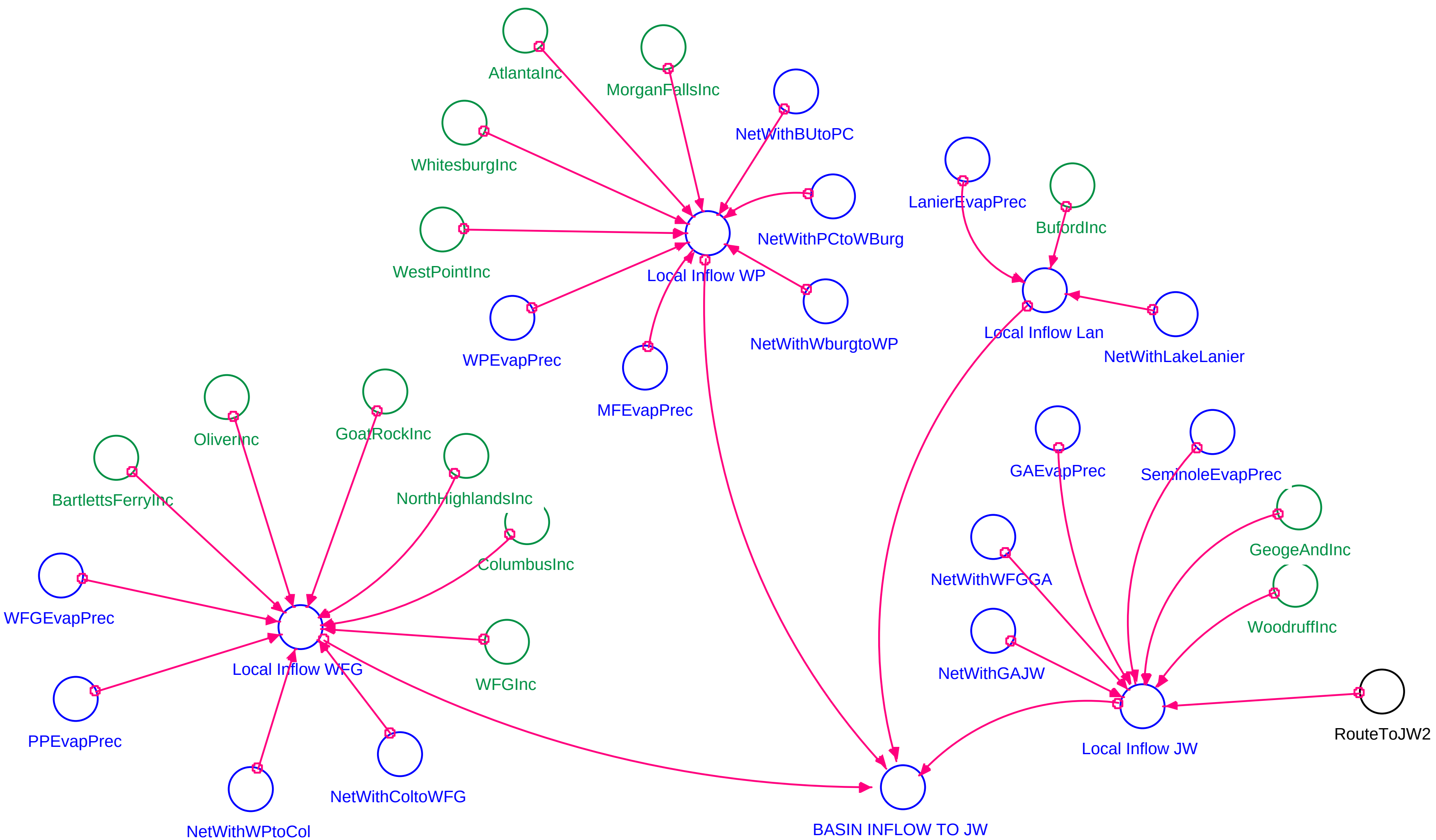
Modeling Approach

- “Routing” not used.
- Calculate required Woodruff releases daily.
- Prorate support from system reservoirs based on system storage, project local inflow, project local drainage area.
- Include support for Woodruff releases in the mix of other established rules governing releases from each reservoir.

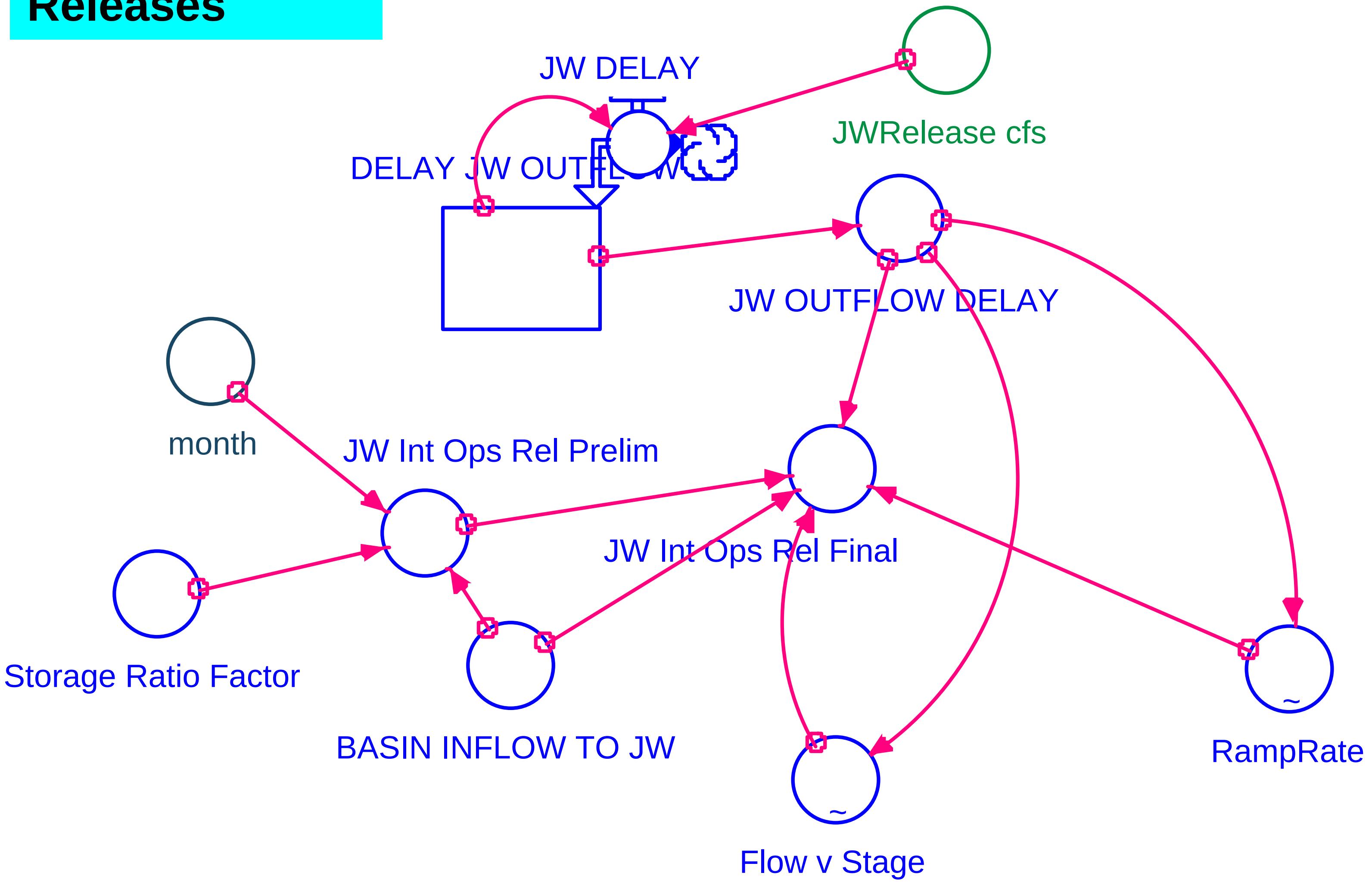
Interim Operations Sector

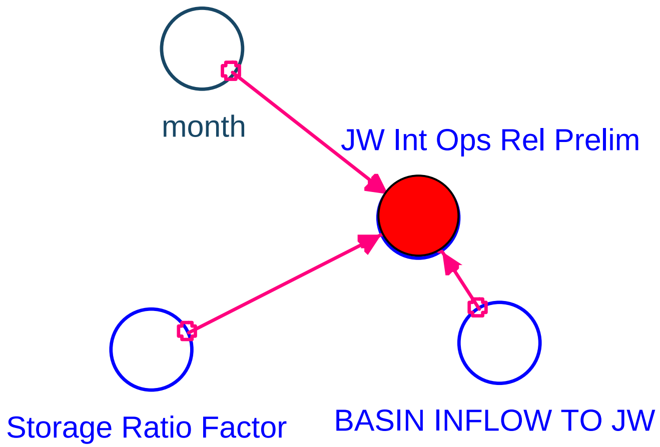


Basin Inflow



Woodruff Releases



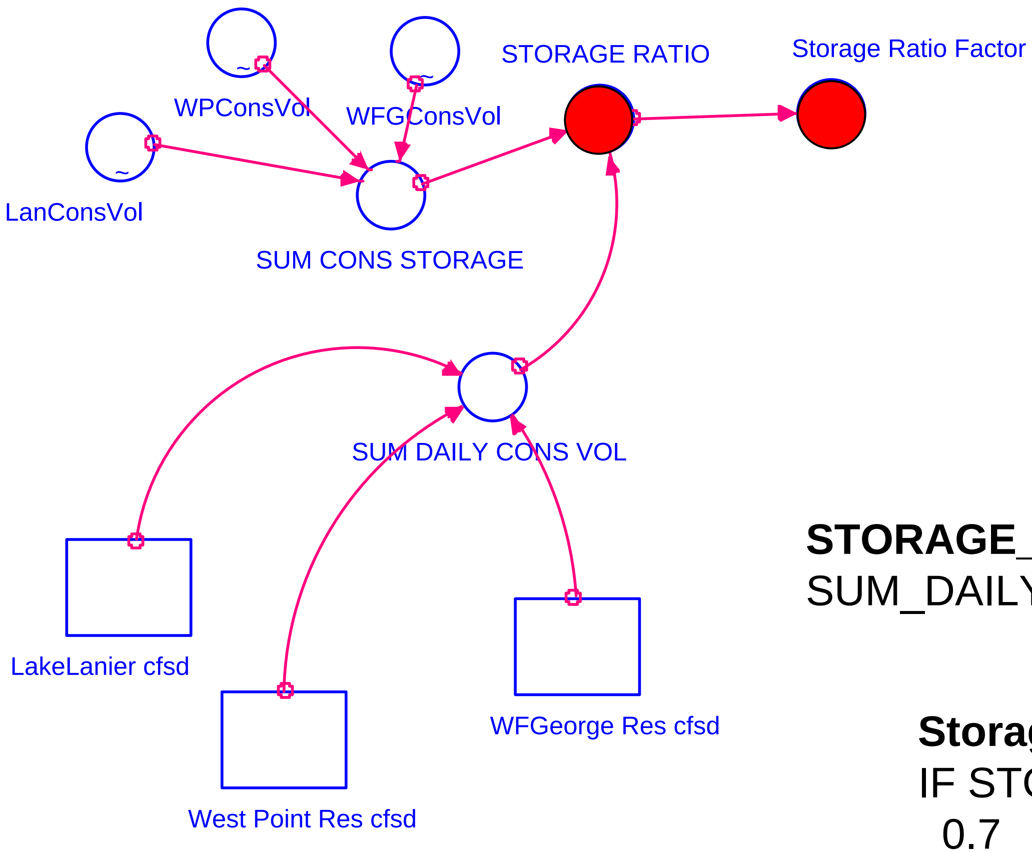


Woodruff Releases
(before ramping rates applied)

JW Int Ops Rel Prelim =

```
IF BASIN_INFLOW_TO_JW >= 37400 THEN
  37400
ELSE
  IF (month >= 3) AND (month <= 5) THEN
    IF BASIN_INFLOW_TO_JW >= 20400 THEN
      MAX (20400, BASIN_INFLOW_TO_JW * Storage_Ratio_Factor)
    ELSE
      MAX (5000, BASIN_INFLOW_TO_JW)
  ELSE
    IF BASIN_INFLOW_TO_JW >= 8000 THEN
      MAX (8000, BASIN_INFLOW_TO_JW * Storage_Ratio_Factor)
    ELSE
      MAX (5000, BASIN_INFLOW_TO_JW)
```

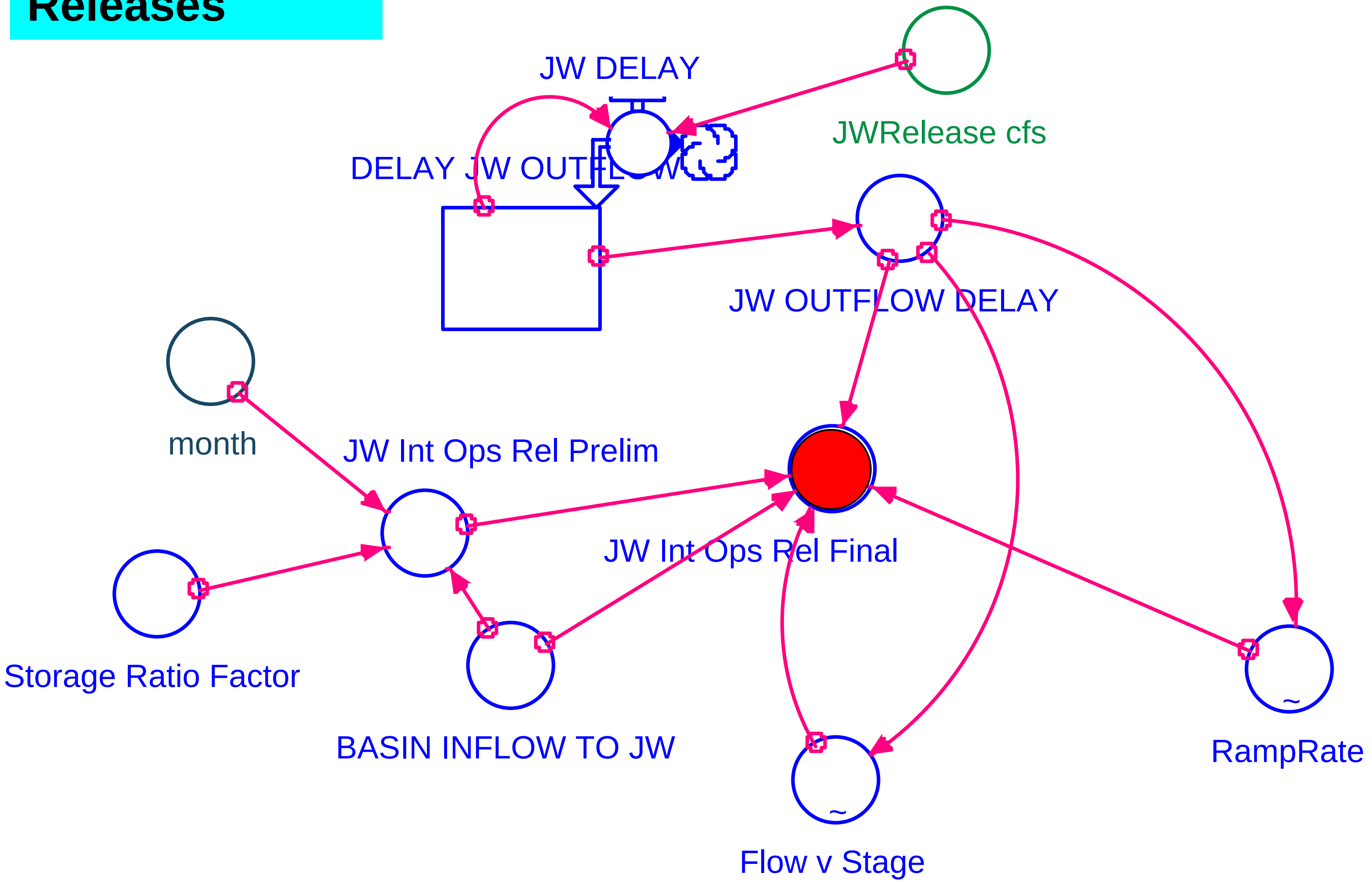
Composite Reservoir Storage for use in computing percentage of basin inflow released

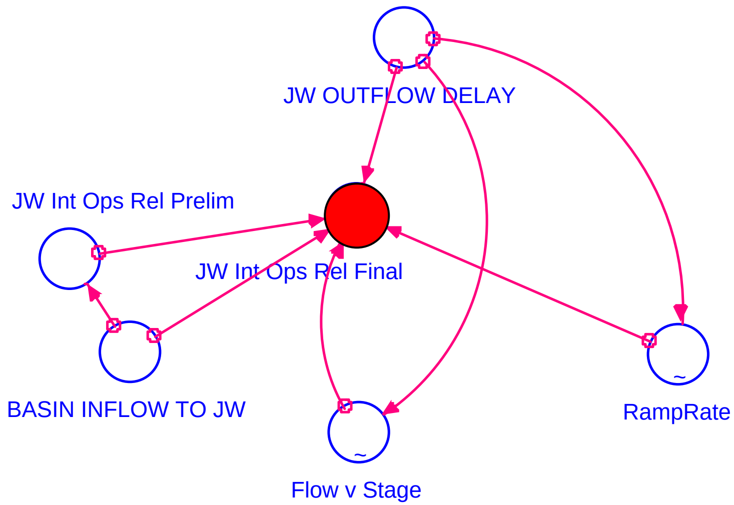


STORAGE_RATIO =
SUM_DAILY_CONS_VOL/SUM_CONS_STORAGE

Storage_Ratio_Factor =
IF STORAGE_RATIO < 0.7 THEN
0.7
ELSE MIN (1, STORAGE_RATIO)

Woodruff Releases

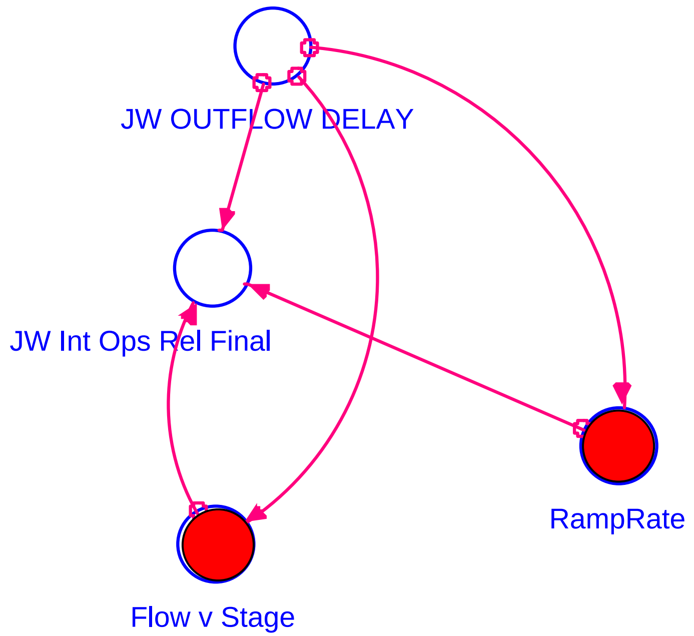




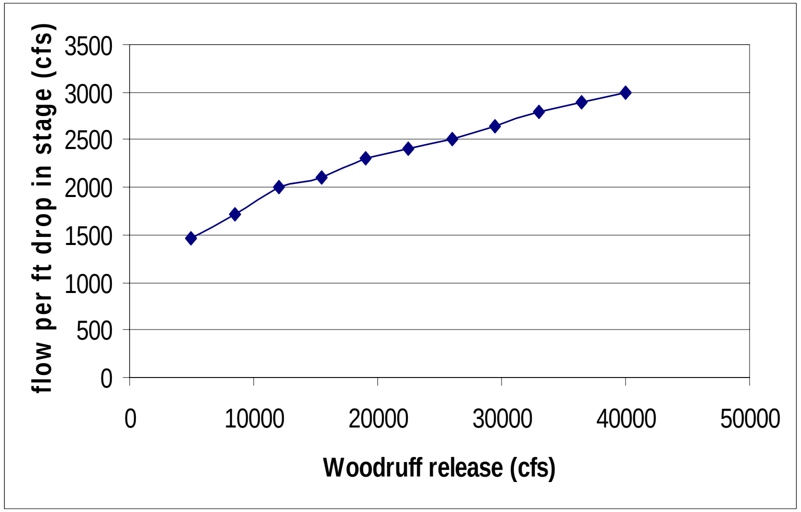
Woodruff Releases
(after ramping rates applied)

JW Int Ops Rel Final =

IF BASIN_INFLOW_TO_JW > 37400 THEN
  JW_Int_Ops_Rel_Prelim
ELSE
  IF JW_OUTFLOW_DELAY < JW_Int_Ops_Rel_Prelim THEN
    JW_Int_Ops_Rel_Prelim
  ELSE
    IF JW_OUTFLOW_DELAY - JW_Int_Ops_Rel_Prelim > Flow_v_Stage * RampRate THEN
      JW_OUTFLOW_DELAY - (Flow_v_Stage * RampRate)
    ELSE
      JW_Int_Ops_Rel_Prelim



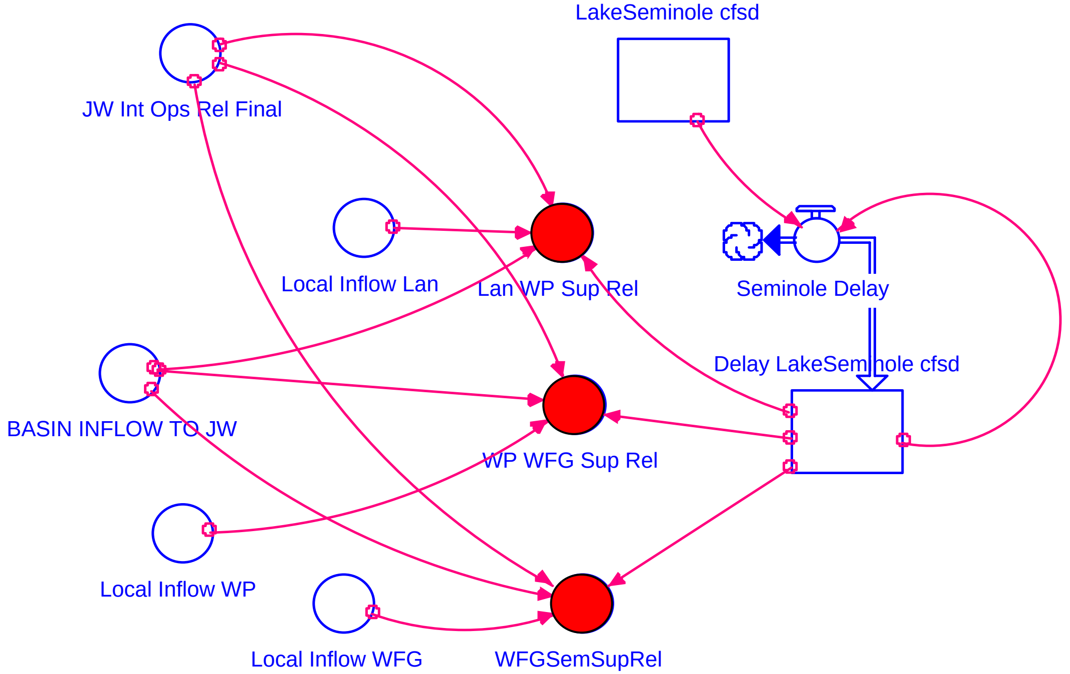
Flow v Stage



RampRate

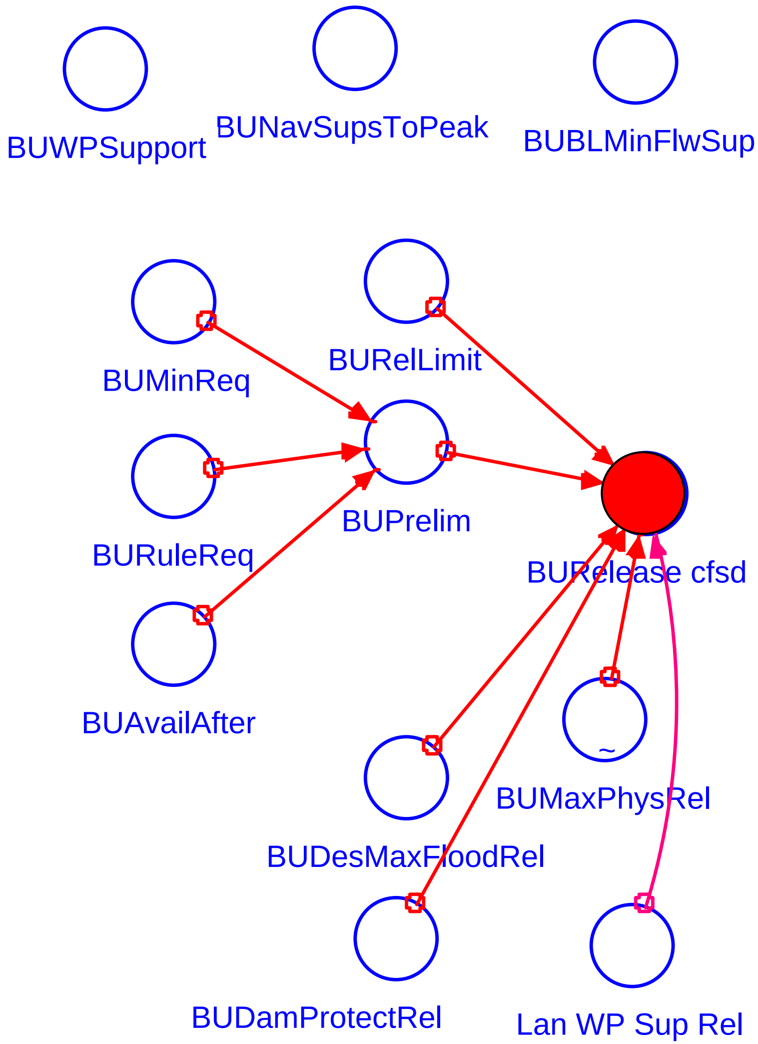
Chattahoochee Reservoir Releases to Support Releases from Woodruff

Upstream Reservoir Support



Lan WP Sup Rel = MAX (
0,
(Local_Inflow_Lan / BASIN_INFLOW_TO_JW) * JW_Int_Ops_Rel_Final,
0.139 * (185190-Delay_LakeSeminole_cfsd))

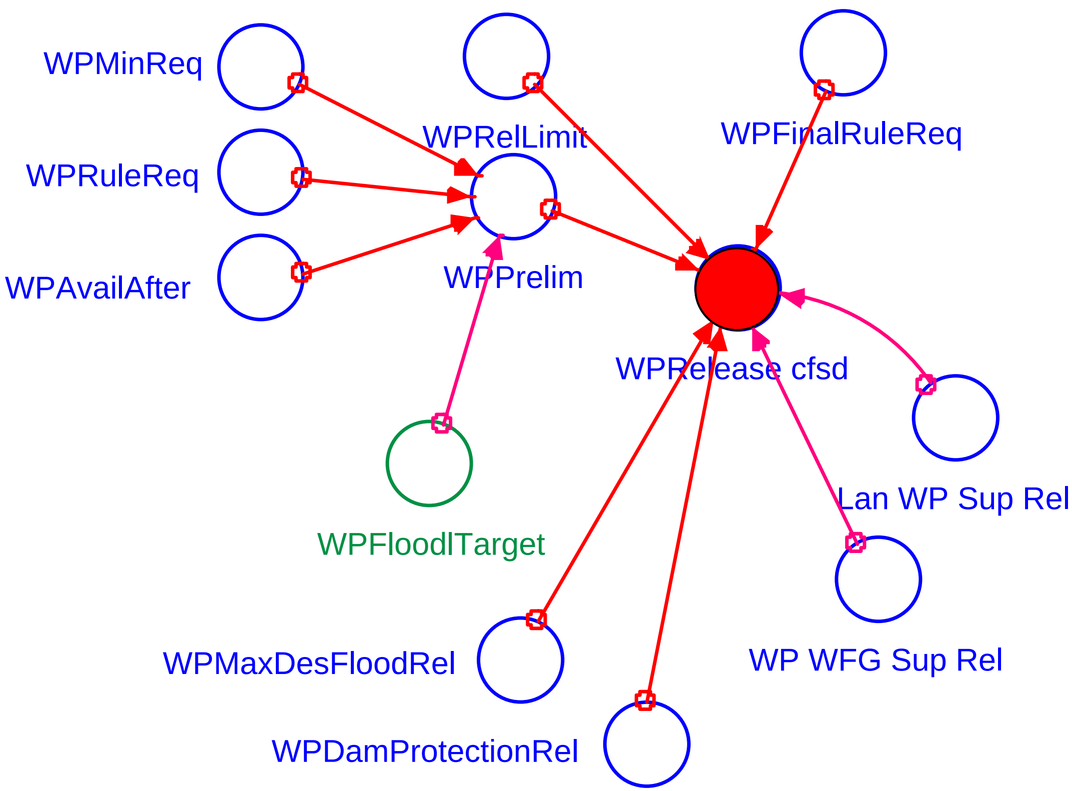
Buford Final Release Calculations



MIN(
 BUMaxPhysRel,
 MAX(
  BUDamProtectRel,
  MIN(
   BURelLimit,
   MAX(BUPrelim, Lan_WP_Sup_Rel),
   BUDesMaxFloodRel)))

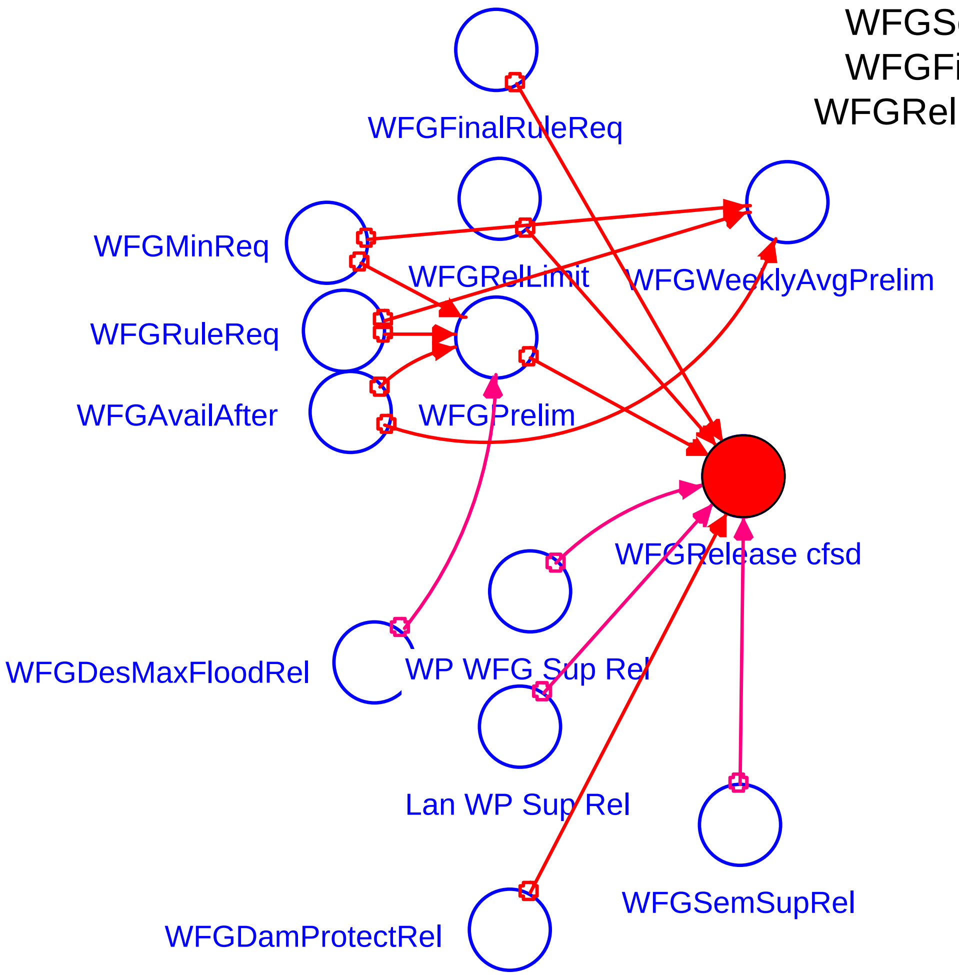
West Point Final Release Calculations

MAX(
WPDamProtectionRel,
MIN(
MAX(WPPrelim, WP_WFG_Sup_Rel + Lan_WP_Sup_Rel, WPFinalRuleReq),
WPRelLimit,
WPMaxDesFloodRel))



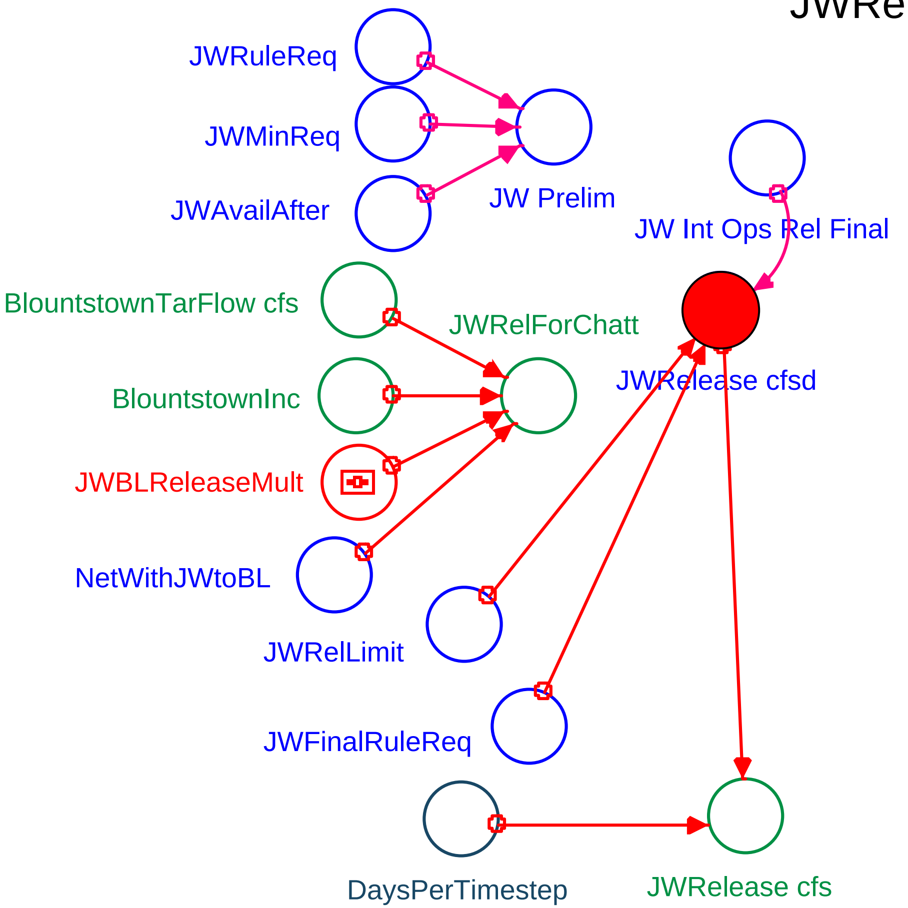
WF George Final Release Calculations

MAX(
WFGDamProtectRel,
MIN(
MAX(
WFGPrelim,
WFGSemSupRel + WP_WFG_Sup_Rel + Lan_WP_Sup_Rel,
WFGFinalRuleReq),
WFGRelLimit))



Woodruff Final Release Calculations

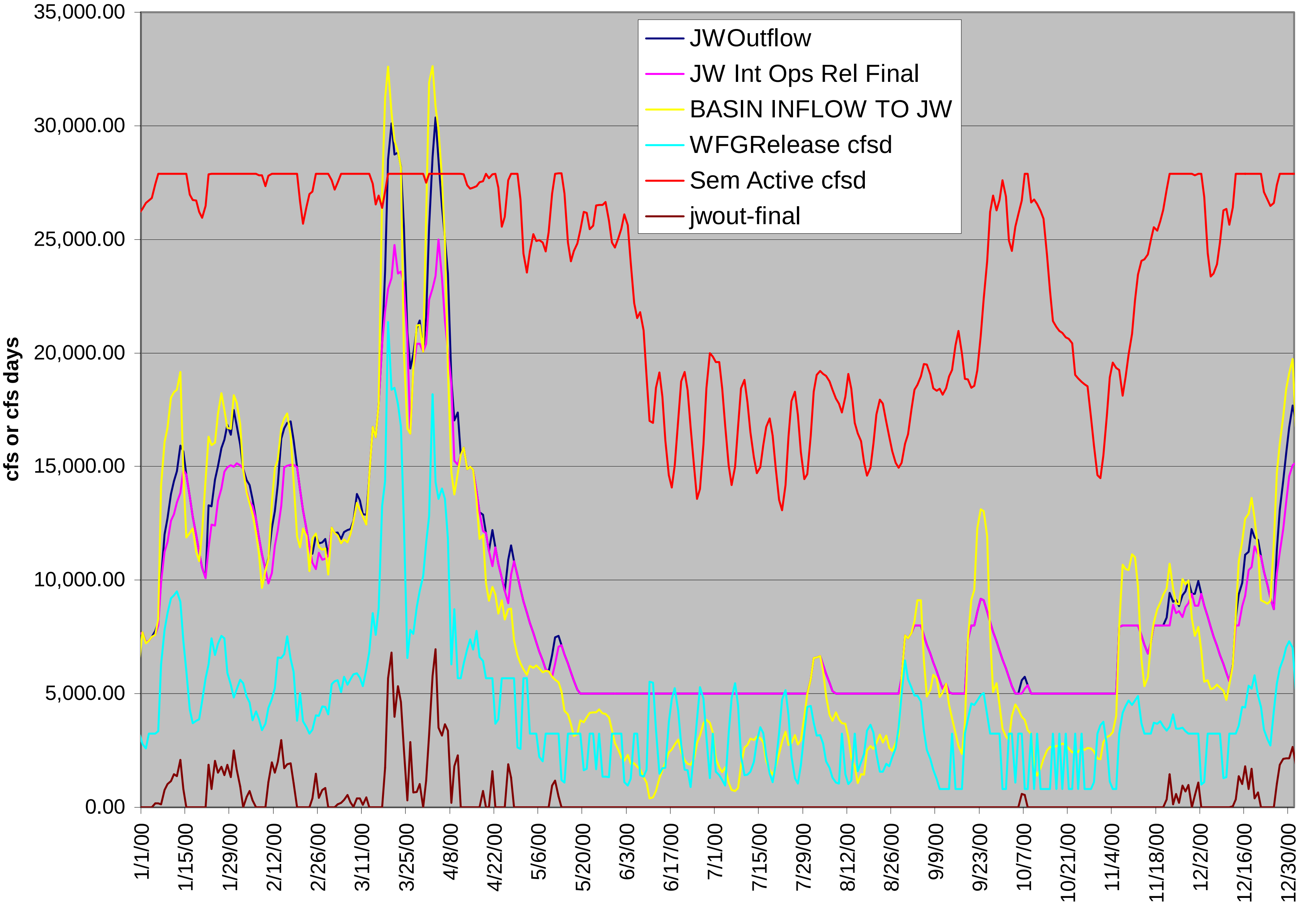
MIN(
MAX(JWFinalRuleReq,JW_Int_Ops_Rel_Final),
JWRelLimit)



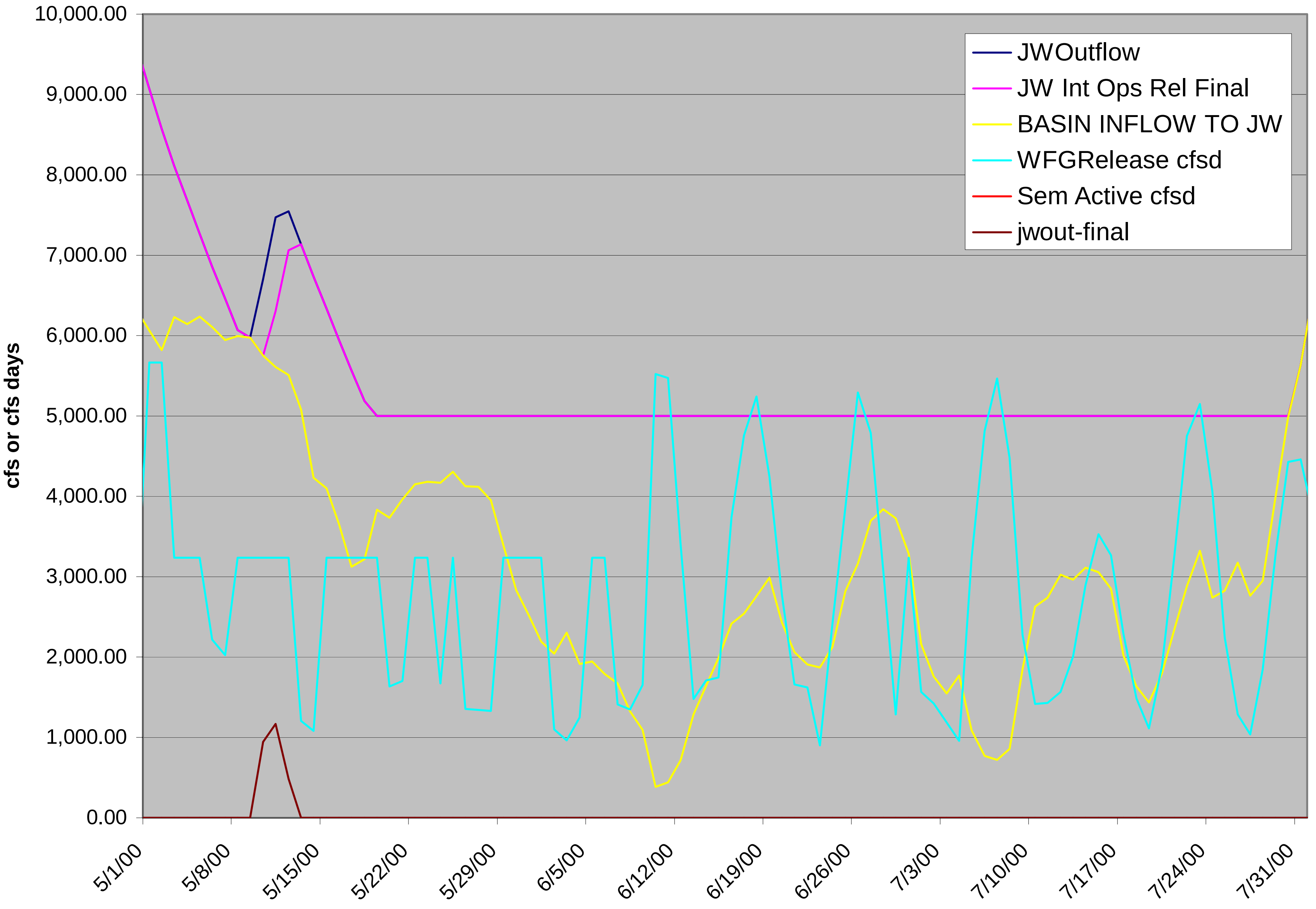
Summary of Woodruff Release Results

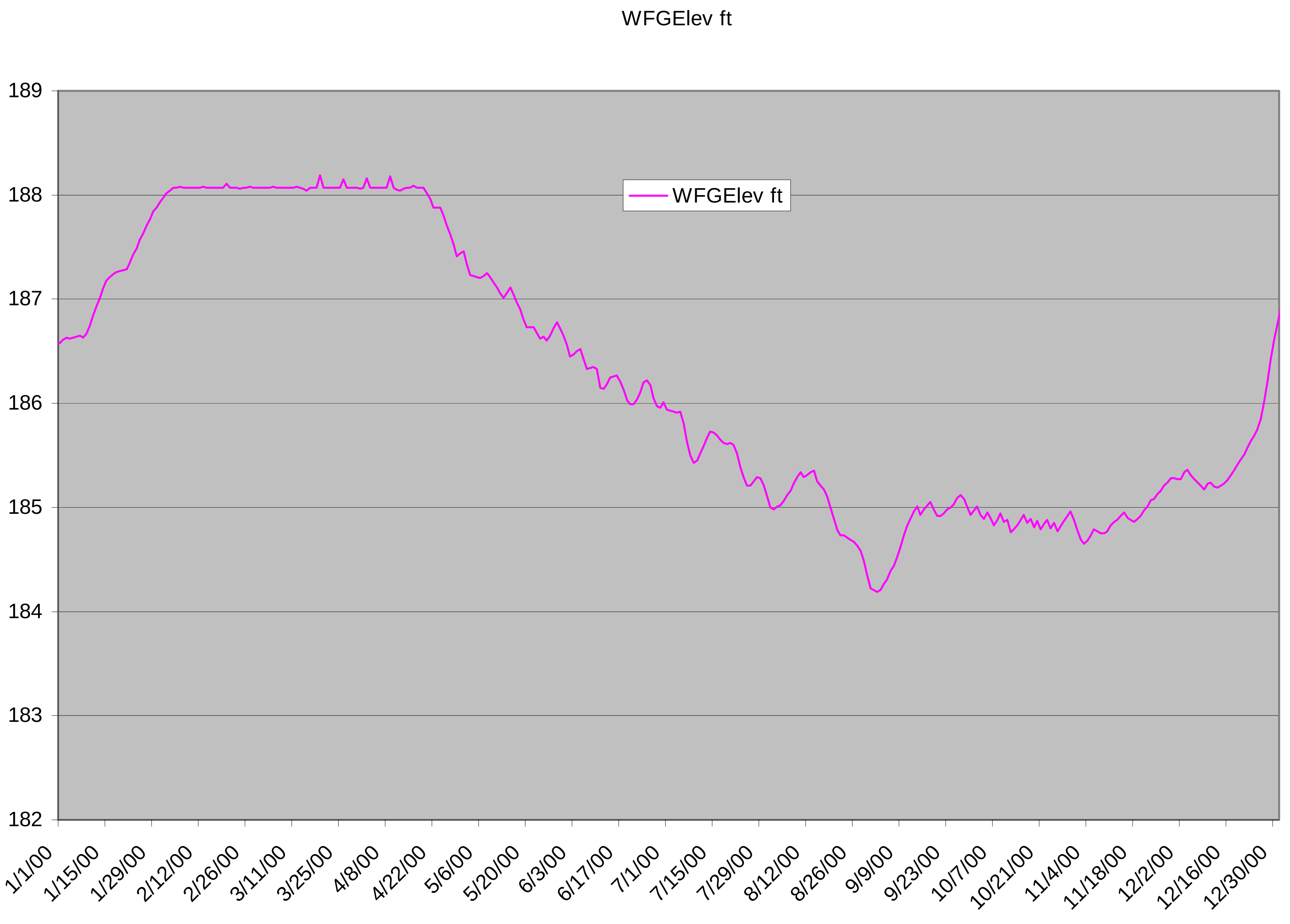
- Woodruff Release >= Interim Minimum Flow 23,011 days (100%) 1939-2001.
- Woodruff Release = Interim Min.
  6610 days (29%).
- Woodruff Release – Interim Min. < 500 cfs
  9232 days (40%).
- WFG Release > Support release for Interim Min. 16199 days (70%).

Year 2000 – Selected Model Output

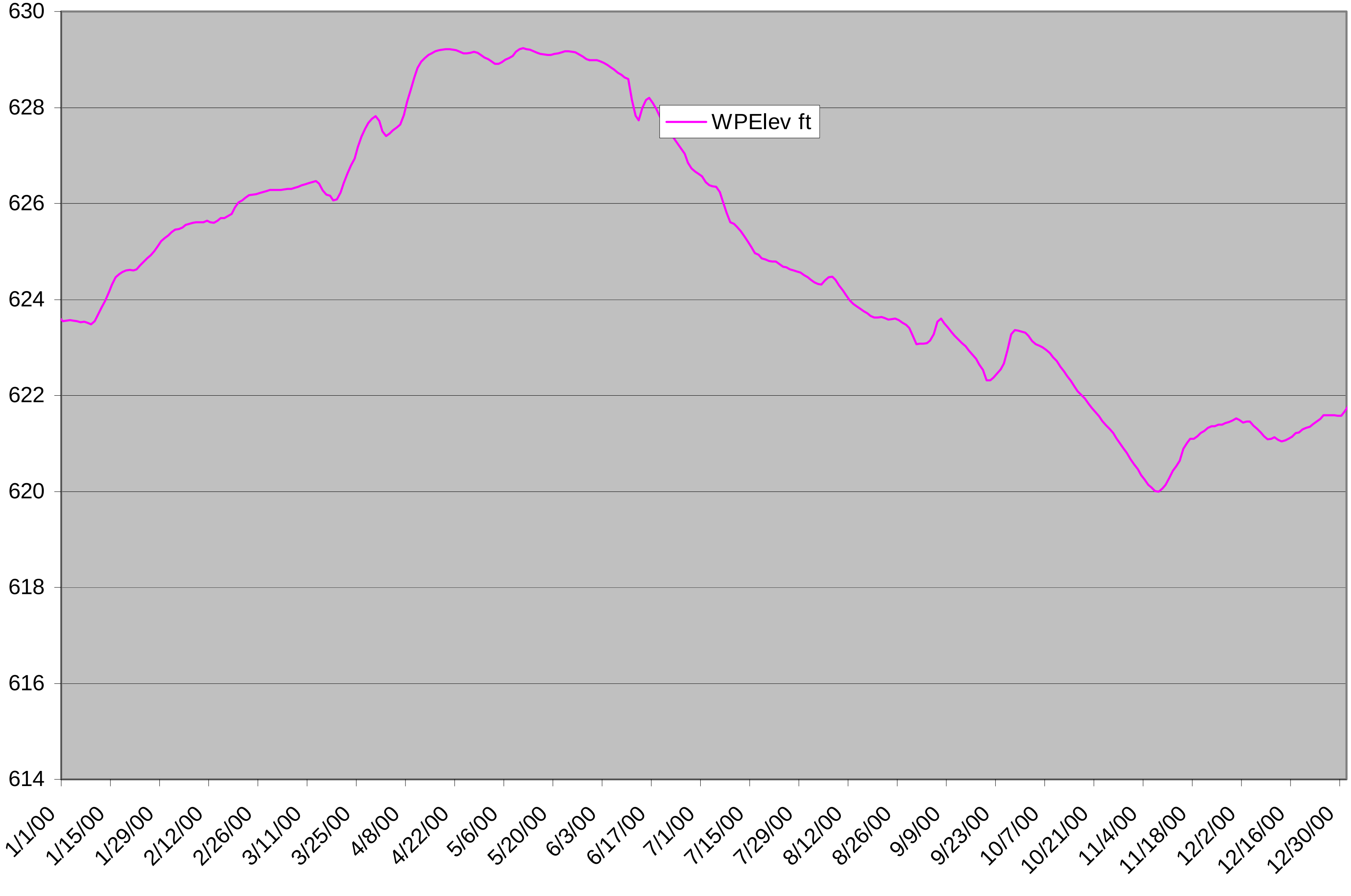


May-July 2000 – Selected Model Output




WFGElev ft
189
188
187
186
185
184
183
182
WFGElev ft
1/1/00
1/15/00
1/29/00
2/12/00
2/26/00
3/11/00
3/25/00
4/8/00
4/22/00
5/6/00
5/20/00
6/3/00
6/17/00
7/1/00
7/15/00
7/29/00
8/12/00
8/26/00
9/9/00
9/23/00
10/7/00
10/21/00
11/4/00
11/18/00
12/2/00
12/16/00
12/30/00

WPElev ft



630
628
626
624
622
620
618
616
614
WPElev ft
1/1/00
1/15/00
1/29/00
2/12/00
2/26/00
3/11/00
3/25/00
4/8/00
4/22/00
5/6/00
5/20/00
6/3/00
6/17/00
7/1/00
7/15/00
7/29/00
8/12/00
8/26/00
9/9/00
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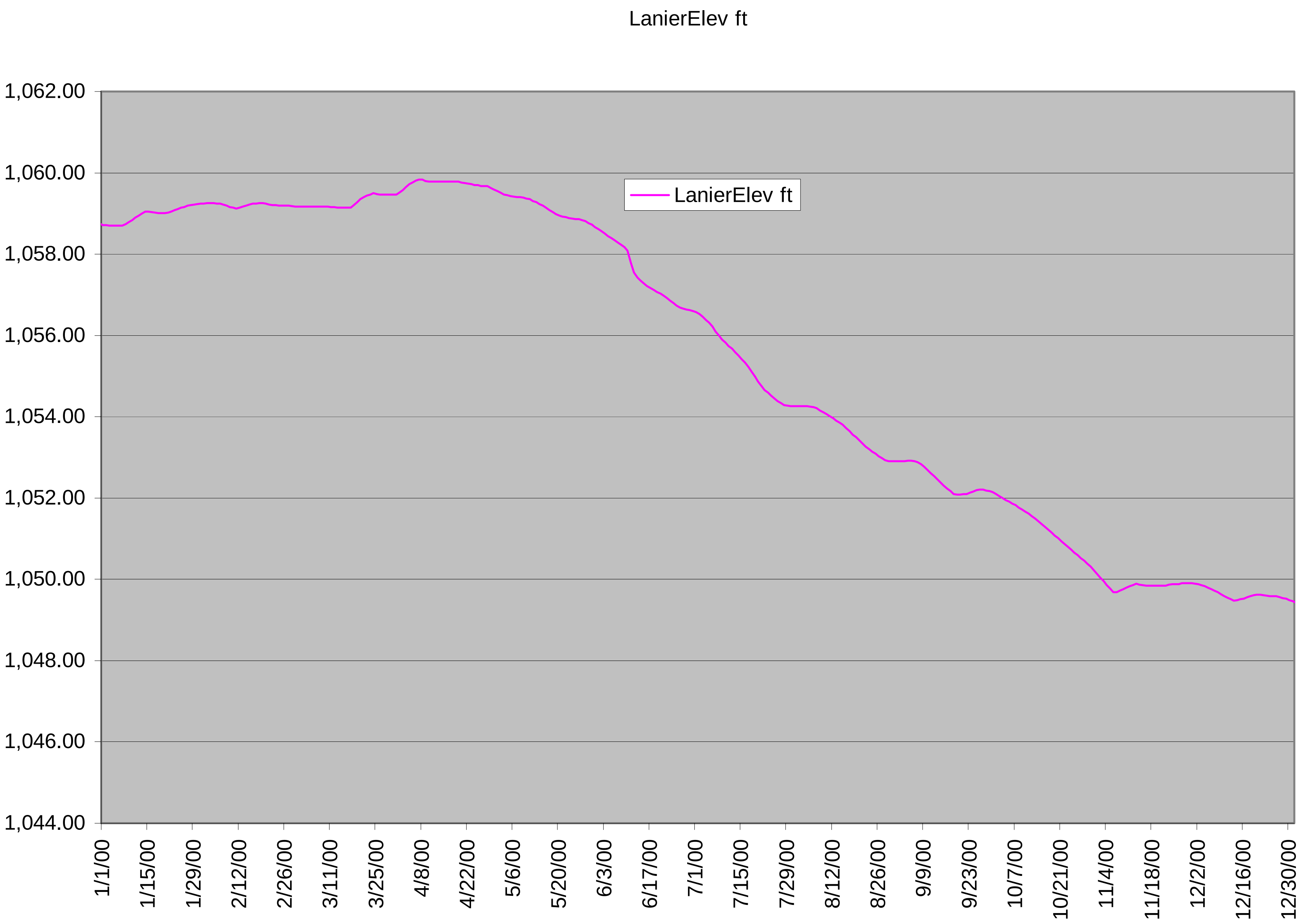
12/2/00
12/16/00
12/30/00



LanierElev ft
LanierElev ft
1,062.00
1,060.00
1,058.00
1,056.00
1,054.00
1,052.00
1,050.00
1,048.00
1,046.00
1,044.00
1/1/00
1/15/00
1/29/00
2/12/00
2/26/00
3/11/00
3/25/00
4/8/00
4/22/00
5/6/00
5/20/00
6/3/00
6/17/00
7/1/00
7/15/00
7/29/00
8/12/00
8/26/00
9/9/00
9/23/00
10/7/00
10/21/00
11/4/00
11/18/00
12/2/00
12/16/00
12/30/00

Further Work Needed:

- As necessary and feasible, enhance model to more closely approximate actual operations.
- Use results to evaluate potential effects on sturgeon, mussels, and their habitat.

Spreadsheet Model Assumptions

- **Weekly time step.**

- **Model focused primarily on meeting interim operations procedure.**
  - Water Supply Demands Not Used.
  - Hydropower Energy Requirements Not Fully Considered.
    - All releases thru turbines when possible
  - Maintain Lakes Within Conservation Storage (Followed Guide Curves for Winter Drawdown and Spring Refill Periods).
  - Operated to balance lakes but did not explicitly match action zones.
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- Model used simplified storage equations.

- Spreadsheet not conducive for looking at longer time periods.
    - Simulations used 1998-2003 inflow data
    - Simulations used 2000-2001 inflow data

- Ramping Rates applied only where reduction in discharge spanned weeks.

Spreadsheet Model Screenshot

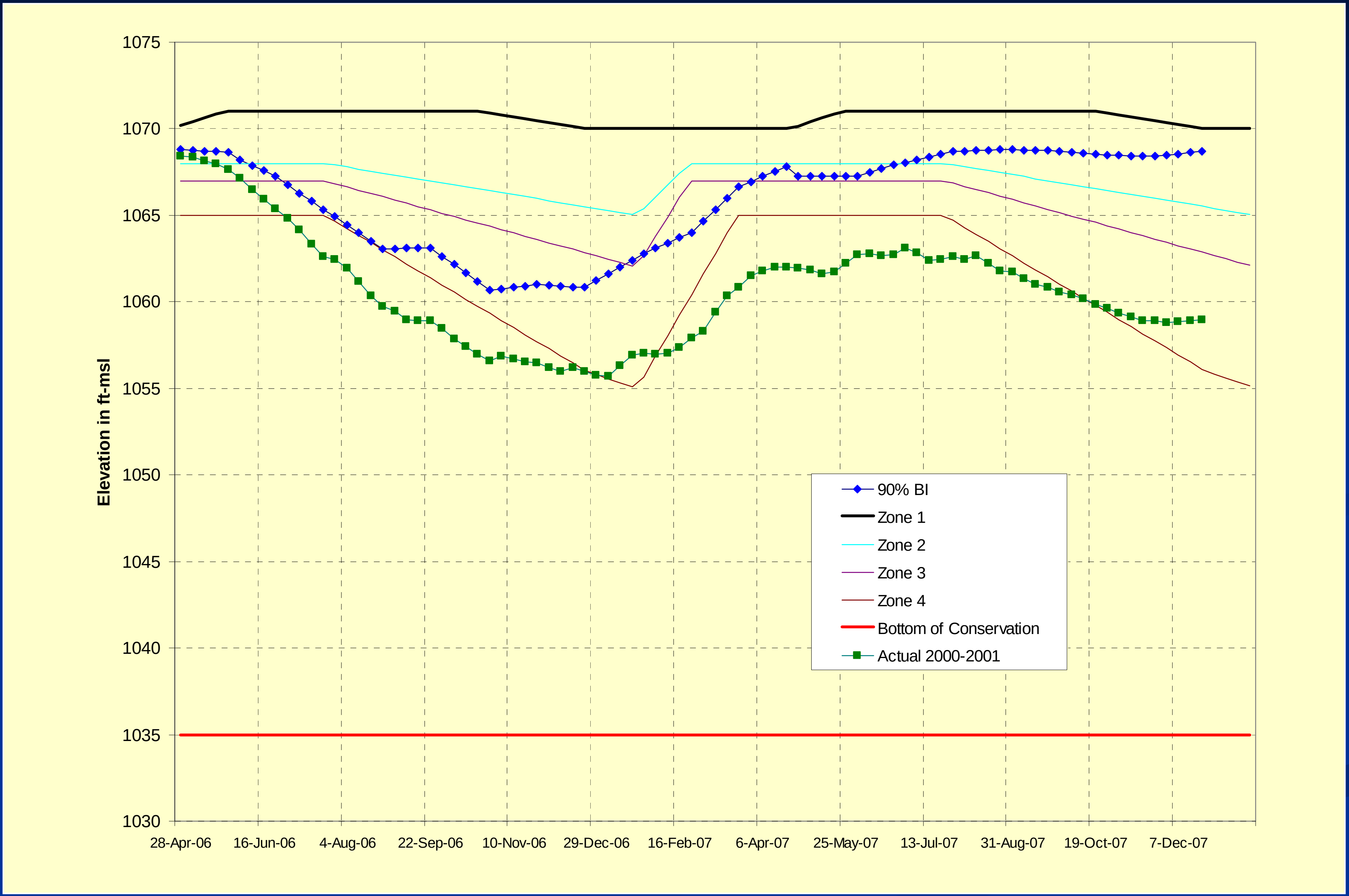
Microsoft Excel - ACF_Projections_ESA_1998-2003

A4 — 6/26/1998

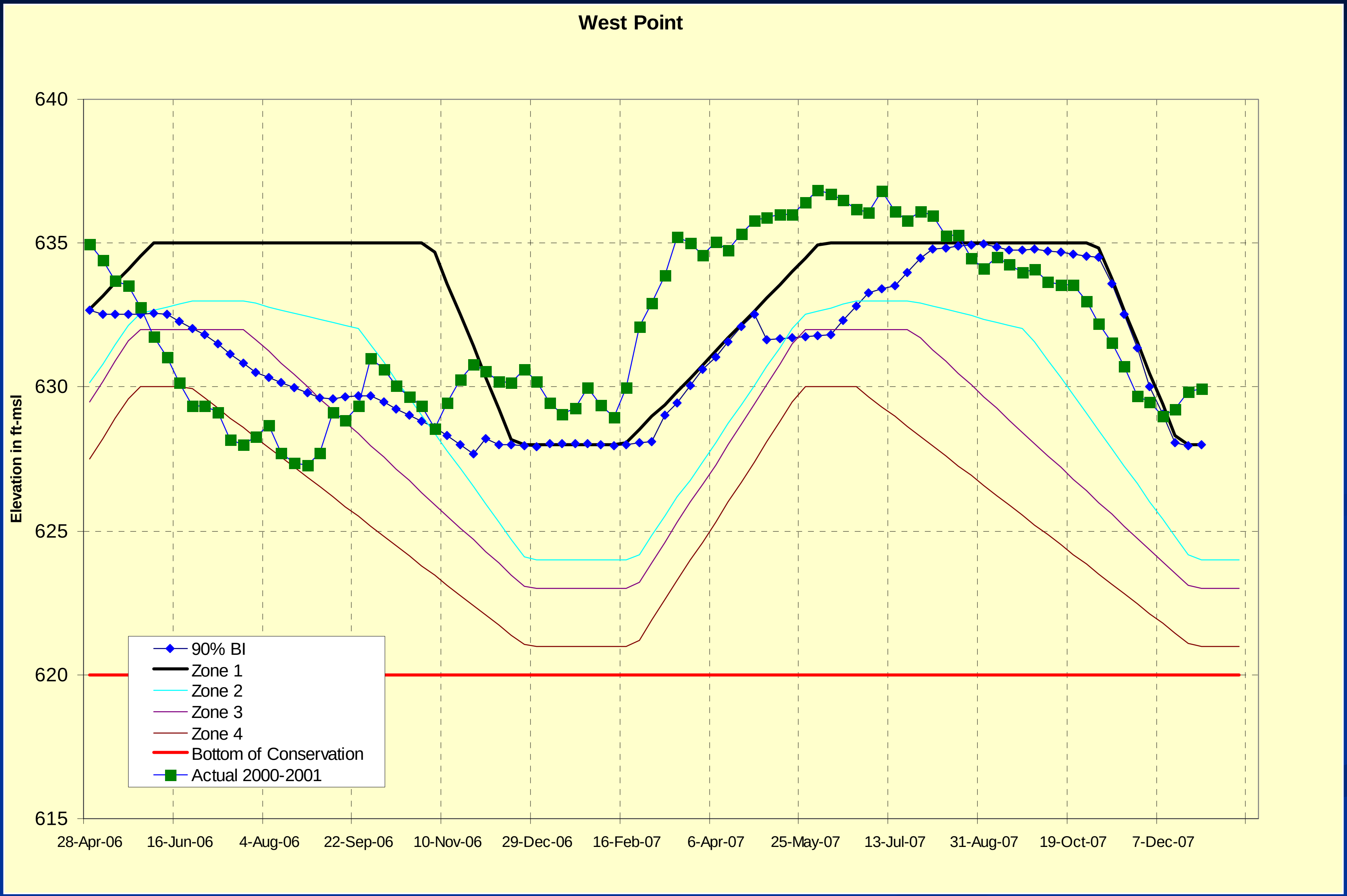
	A	B	C	D	E	F	G	H	I	J	K	L	M	O	P	R	S
1														1-Mar	31-May	Release Min20,400 cfs	
2		Interim Operations						1998-2003 Flow Conditions Interim Operations								Release 16,000cfs	
3																100% Flow below 30,000	
4	6/26/1998							TOTAL	SLUICE		HIST	% HIST					
5		ELEVATION		LOCALS		TOTAL		GEN	SPILL		LOC	LOC	Storage				MAX GEN
6		STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	CFS								21336
7	BUFORD	1071.12	1071.06	6846	978	6846	8000	2000	0		1409	69%	987137				504
8	WEST POINT	635.61	635.05	5145	735	13145	19331	504	2200		2219	33%	305412				21000
9	GEORGE	189.15	189.44	12467	1781	31798	26000	4000	0		2861	62%	459225				
10	WOODRUFF	77.33	77.40	47502	6786	73502	72100				9918	68%					
11					10280	JWD OUT	10300			100%	16407	63%	1751774			blst shift	2100
12	WEEK ENDING	3-Jul-98															
13																	
14								TOTAL	SLUICE		HIST	% HIST					
15		ELEVATION		LOCALS		TOTAL		GEN	SPILL		LOC	LOC					
16		STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)								
17	BUFORD	1071.06	1071.00	6846	978	6846	8000	2000	0		1409	69%	985954				
18	WEST POINT	635.05	635.06	5145	735	13880	13731	504	1400		2219	33%	305588				
19	GEORGE	189.44	189.71	12467	1781	26198	20800	3200	0		2861	62%	465301				
20	WOODRUFF	77.40	77.20	47502	6786	68302	72100				9918	68%					
21					10280	JWD OUT	10300			100%	16407	63%	1756843				
22	WEEK ENDING	10-Jul-98															
23																	
24								TOTAL	SLUICE		HIST	% HIST					
25		ELEVATION		LOCALS		TOTAL		GEN	SPILL		LOC	LOC					
26		STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)								
27	BUFORD	1071.00	1071.04	6846	978	6846	6000	1500	0		1409	69%	986821				
28	WEST POINT	635.06	635.02	5145	735	11880	12331	504	1200		2219	33%	305053				
29	GEORGE	189.71	189.78	12467	1781	24798	23400	3600	0		2861	62%	466885				
30	WOODRUFF	77.20	77.14	47502	6786	70902	72100				9918	68%					
31					10280	JWD OUT	10300			100%	16407	63%	1758759				
32	WEEK ENDING	17-Jul-98															
33																	
34								TOTAL	SLUICE		HIST	% HIST					
35		ELEVATION		LOCALS		TOTAL		GEN	SPILL		LOC	LOC					
36		STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)								
37	BUFORD	1071.04	1071.09	6846	978	6846	6000	1500	0		1409	69%	987690				
38	WEST POINT	635.02	635.04	5145	735	11880	11631	504	1100		2219	33%	305348				

FL Proposal / Interim Operations / Sheet1 / Buford Chart / West Point Chart / WF George Chart / Summary / Storage Zones / Elev Zones

Lake Lanier



Elevation in ft-msl
1075
1070
1065
1060
1055
1050
1045
1040
1035
1030
28-Apr-06
16-Jun-06
4-Aug-06
22-Sep-06
10-Nov-06
29-Dec-06
16-Feb-07
6-Apr-07
25-May-07
13-Jul-07
31-Aug-07
19-Oct-07
7-Dec-07
90% BI
Zone 1
Zone 2
Zone 3
Zone 4
Bottom of Conservation
Actual 2000-2001



West Point
Elevation in ft-msl
640
635
630
625
620
615
28-Apr-06
16-Jun-06
4-Aug-06
22-Sep-06
10-Nov-06
29-Dec-06
16-Feb-07
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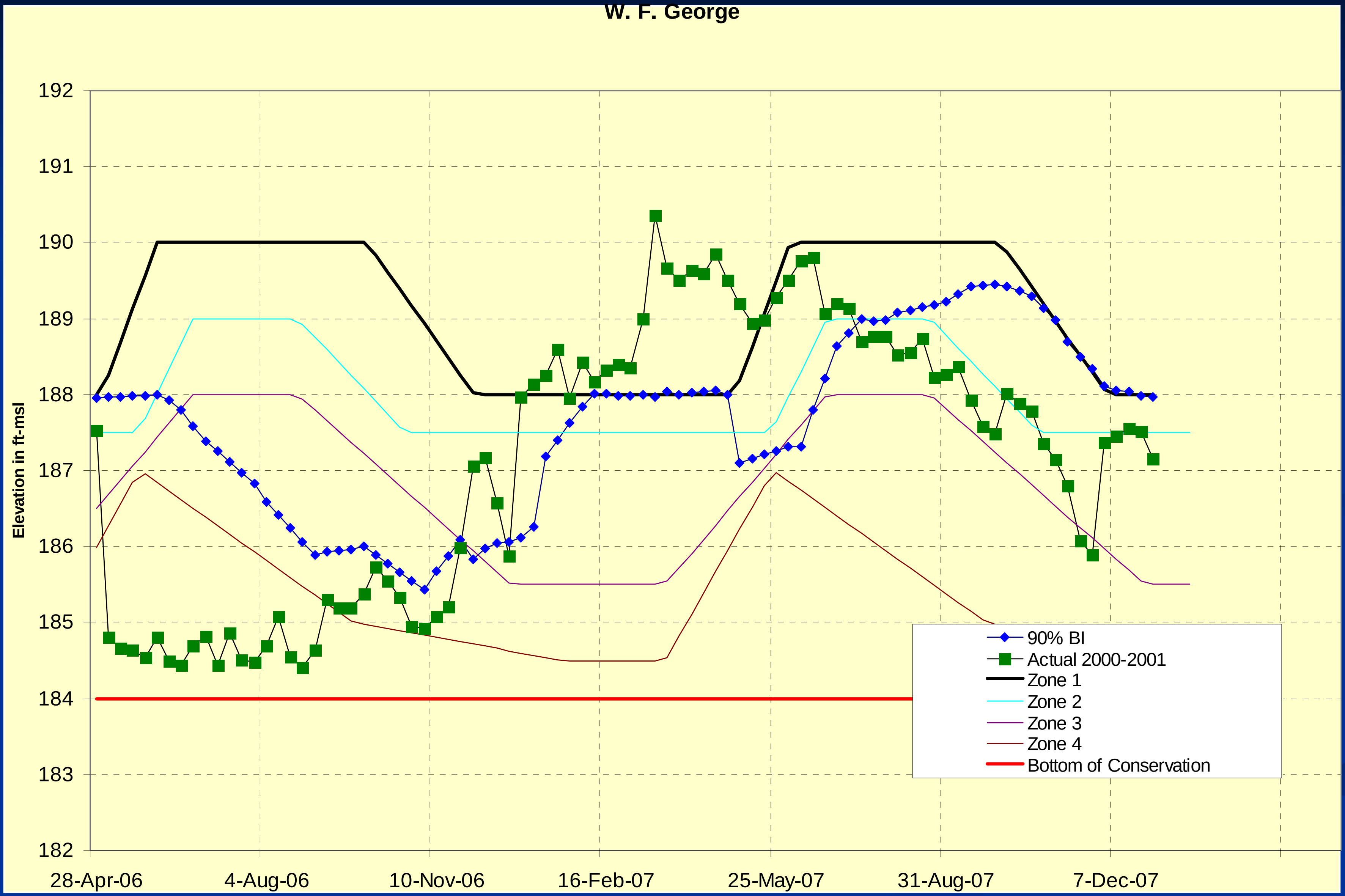
Bottom of Conservation
Actual 2000-2001



W. F. George
Elevation in ft-msl
192
191
190
189
188
187
186
185
184
183
182
28-Apr-06
4-Aug-06
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31-Aug-07
7-Dec-07
90% BI
Actual 2000-2001
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Zone 4
Bottom of Conservation

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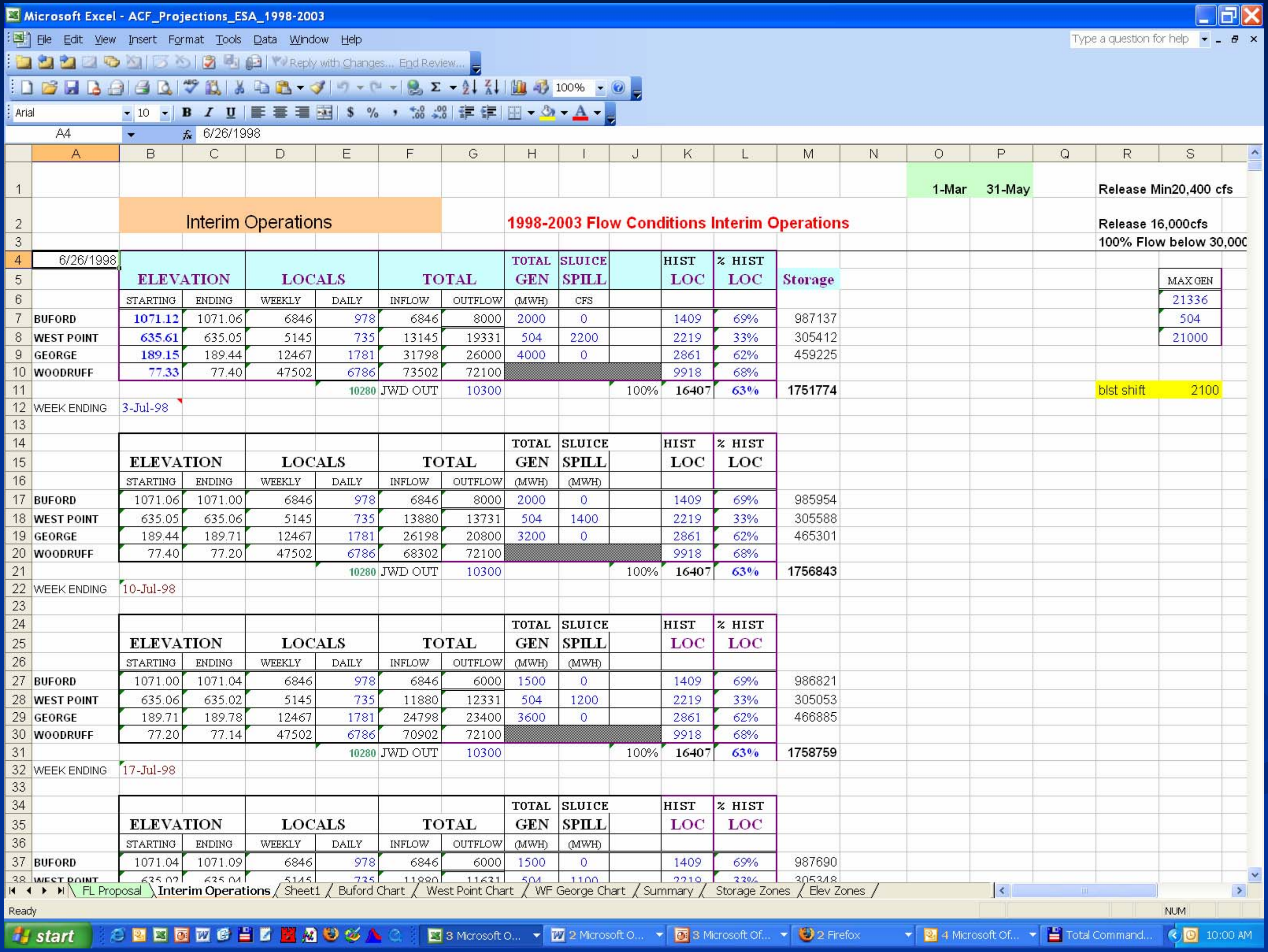
Spreadsheet Model Screenshot



Interim Operations

1998-2003 Flow Conditions Interim Operations

	ELEVATION		LOCALS		TOTAL		TOTAL GEN	SLUICE SPILL		HIST LOC	% HIST LOC	Storage
6/26/1998	STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	CFS				
BUFORD	1071.12	1071.06	6846	978	6846	8000	2000	0		1409	69%	987137
WEST POINT	635.61	635.05	5145	735	13145	19331	504	2200		2219	33%	305412
GEORGE	189.15	189.44	12467	1781	31798	26000	4000	0		2861	62%	459225
WOODRUFF	77.33	77.40	47502	6786	73502	72100				9918	68%	
				10280	JWD OUT	10300			100%	16407	63%	1751774
WEEK ENDING	3-Jul-98											

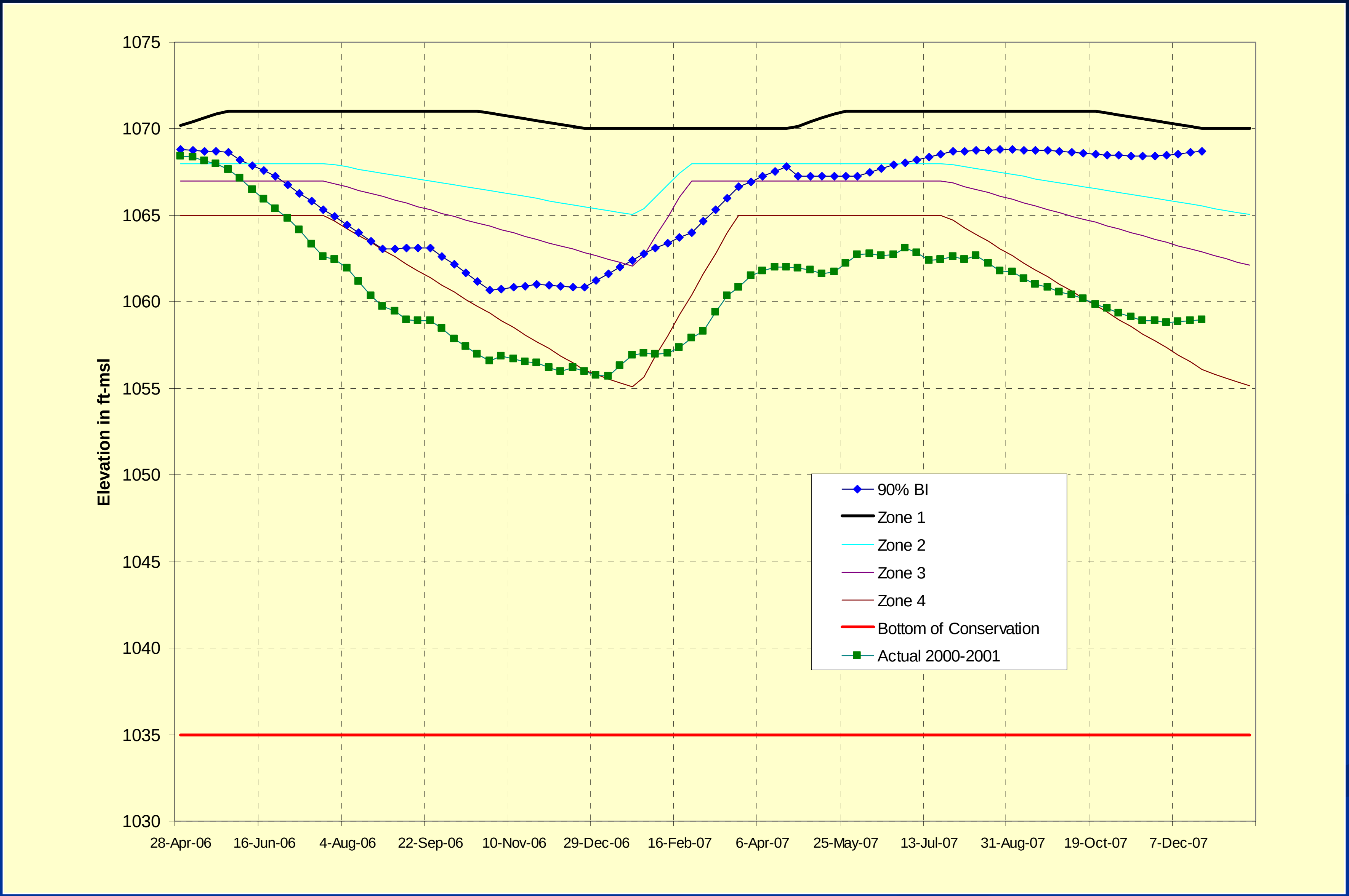
	ELEVATION		LOCALS		TOTAL		TOTAL GEN	SLUICE SPILL		HIST LOC	% HIST LOC	
	STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)				
BUFORD	1071.06	1071.00	6846	978	6846	8000	2000	0		1409	69%	985954
WEST POINT	635.05	635.06	5145	735	13880	13731	504	1400		2219	33%	305588
GEORGE	189.44	189.71	12467	1781	26198	20800	3200	0		2861	62%	465301
WOODRUFF	77.40	77.20	47502	6786	68302	72100				9918	68%	
				10280	JWD OUT	10300			100%	16407	63%	1756843
WEEK ENDING	10-Jul-98											

	ELEVATION		LOCALS		TOTAL		TOTAL GEN	SLUICE SPILL		HIST LOC	% HIST LOC	
	STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)				
BUFORD	1071.00	1071.04	6846	978	6846	6000	1500	0		1409	69%	986821
WEST POINT	635.06	635.02	5145	735	11880	12331	504	1200		2219	33%	305053
GEORGE	189.71	189.78	12467	1781	24798	23400	3600	0		2861	62%	466885
WOODRUFF	77.20	77.14	47502	6786	70902	72100				9918	68%	
				10280	JWD OUT	10300			100%	16407	63%	1758759
WEEK ENDING	17-Jul-98											

	ELEVATION		LOCALS		TOTAL		TOTAL GEN	SLUICE SPILL		HIST LOC	% HIST LOC	
	STARTING	ENDING	WEEKLY	DAILY	INFLOW	OUTFLOW	(MWH)	(MWH)				
BUFORD	1071.04	1071.09	6846	978	6846	6000	1500	0		1409	69%	987690
WEST POINT	635.02	635.04	5145	735	11880	11631	504	1100		2219	33%	305348

1-Mar	31-May		
		Release Min20,400 cfs	
		Release 16,000cfs	
		100% Flow below 30,000	
			MAX GEN
			21336
			504
			21000
		blst shift	2100

Lake Lanier



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90% BI
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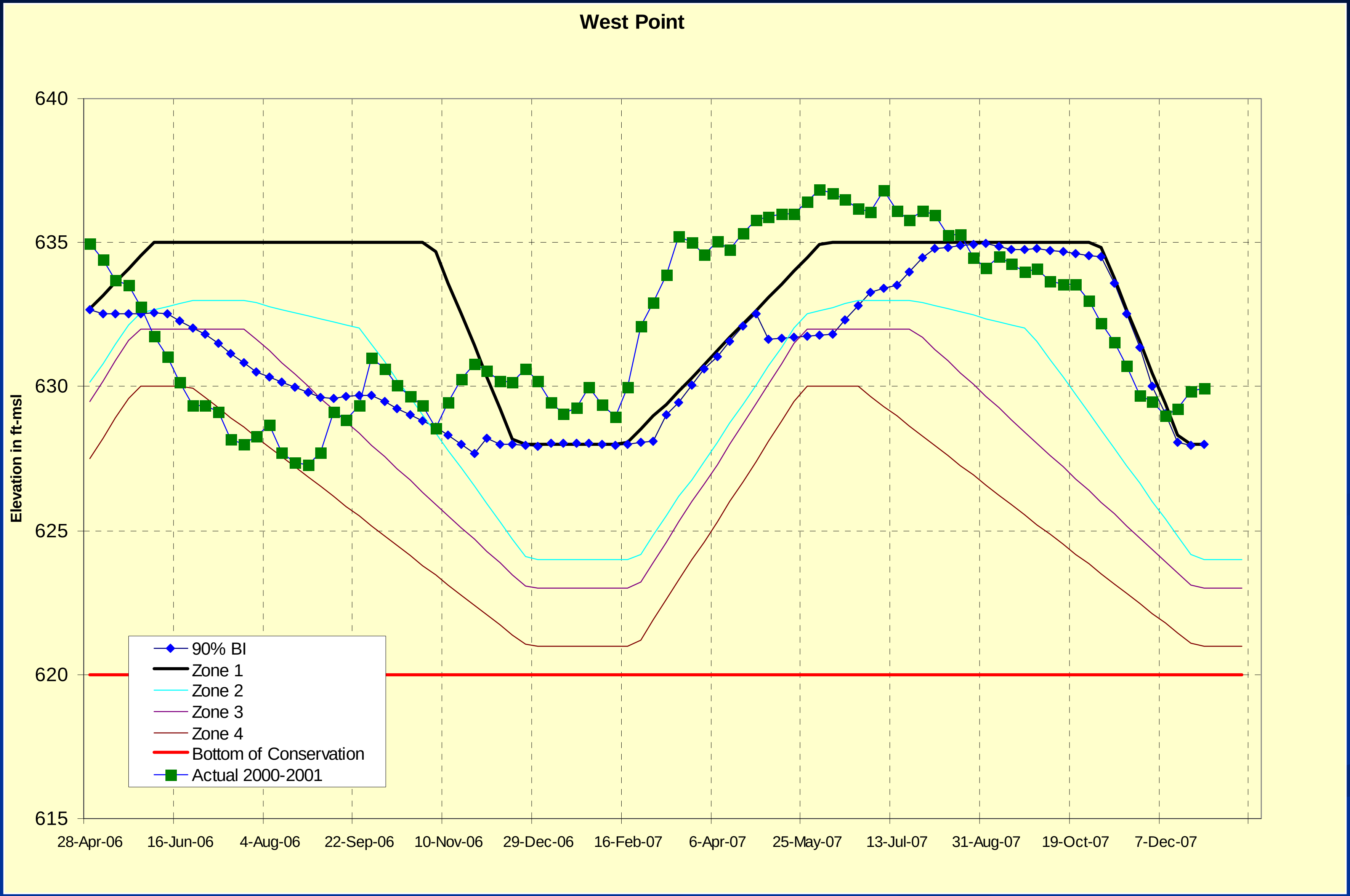
Zone 4
Bottom of Conservation
Actual 2000-2001



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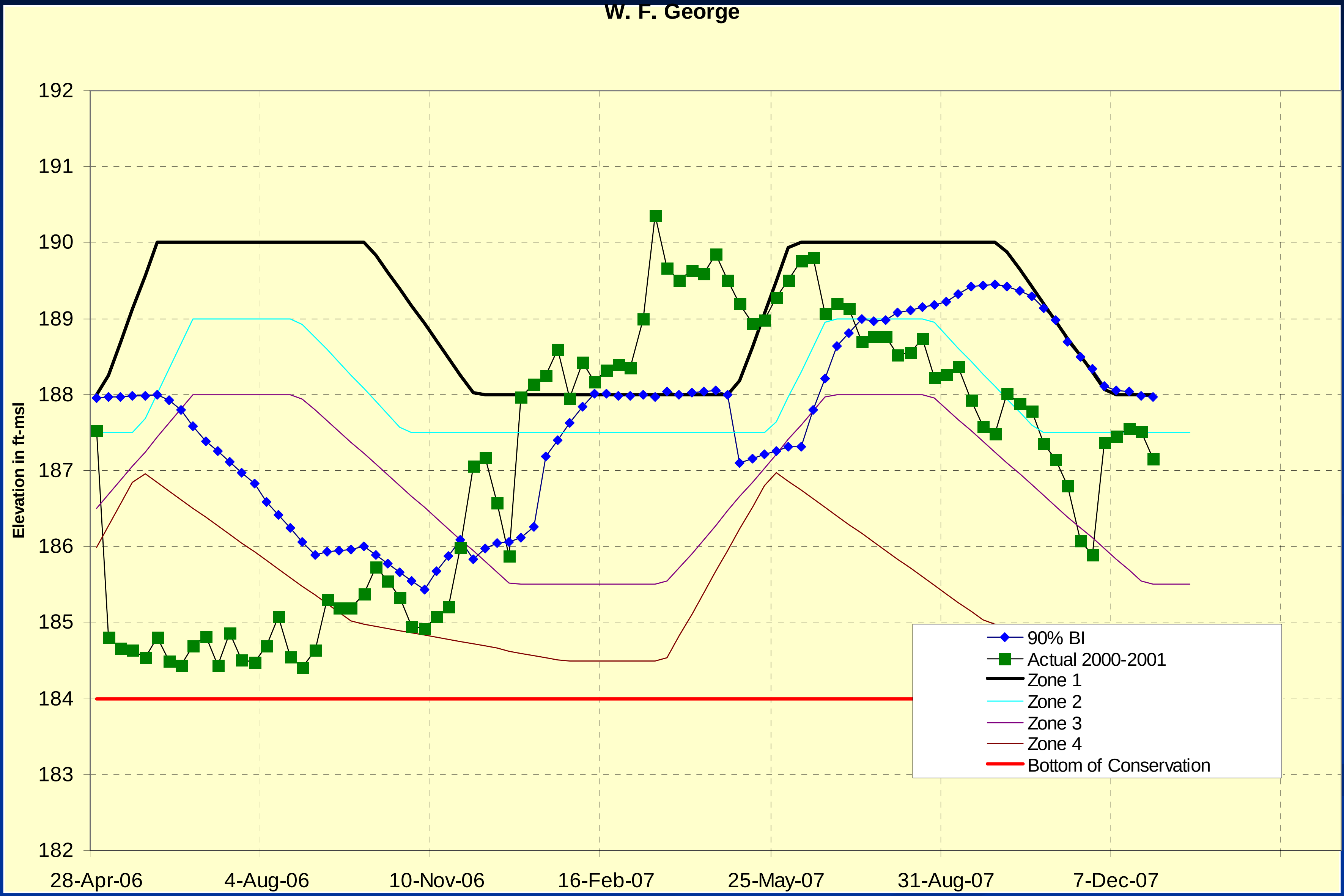

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Elevation in ft-msl
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90% BI
Actual 2000-2001
Zone 1
Zone 2
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Zone 4
Bottom of Conservation

D-5 CESAM letter to USFWS, dated 12 June 2006, Request for Adjustments to the IOP

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

REPLY TO
ATTENTION OF

June 12, 2006

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:

As you are aware, on March 7, 2006, the U.S. Army Corps of Engineers, Mobile District initiated formal consultation with the U.S. Fish and Wildlife Service (USFWS) pursuant to Section 7 of the Endangered Species Act of 1973 regarding our existing water management operations at Jim Woodruff Dam. This consultation addresses the potential for impacts to the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, the endangered fat threeridge mussel, and the threatened purple bankclimber mussel, all which occur on the Apalachicola River downstream of Jim Woodruff Dam. In our request to initiate formal consultation, we included an Interim Operations Plan (IOP) that described the water management operations that we would implement until the existing Water Control Plan is updated at a future date. Since beginning formal consultation, we have held numerous discussions with Mr. Jerry Ziewitz of your staff; initiated parallel modeling of the proposed Interim Operations Plan using a STELLA model (conducted by USFWS and Steve Leitman of Phipps Foundation) and a HEC-5 model (conducted by Mobile District); and conducted a technical modeling workshop to assist in identifying appropriate modeling approaches and assumptions to incorporate into the models. We are also in the process of computing areas of suitable Gulf sturgeon spawning habitat in the upper Apalachicola River inundated by various flow levels.

As a result of these efforts, and in light of the "lessons learned" during our operations under the IOP this spring, we have identified several proposed adjustments to the IOP that could minimize unintended impacts on project operations and improve our ability to manage releases from Jim Woodruff Dam to meet the needs of the federally-listed species. Enclosed is a Memorandum for Record of our telephone conference on April 25, 2006, during which we discussed some of these adjustments and considered recommendations for improvements to the IOP with Mr. Ziewitz. A summary of the identified adjustments is also enclosed. These proposed adjustments include the method for computing basin inflows to manage releases under the IOP (using a 7-day average basin inflow rather than a 3-day average); tying computations of basin inflows and releases to the Chattahoochee gage; clarifying threshold flows for ramping rates associated with flood control operations; and clarifying how releases for gradual ramping rates are captured in the volumetric computation of releases to meet the volumetric computation of basin inflows. Also included is the hydropower generation operation that occurs at Jim Woodruff powerhouse, where releases are temporarily increased for a few hours daily to meet contractual hydropower demands. This operation is described in the enclosed memorandum for record and summary of adjustments, and does not result in a net increase in the volume of water released from Jim Woodruff Dam. We also are proposing an adjustment to the upper flow threshold for the months June through February, for which a percentage of the basin inflows below this threshold would be stored. This adjustment is believed to be necessary to accommodate some additional storage during significant rain events that may occur during extended dry periods. This modification would enhance our ability to refill or conserve storage, minimize the burden on reservoir storage and adverse impacts to other project purposes, and to assure that adequate storage would be available for maintaining minimum flows for mussels in the event the extended dry conditions continue through the remainder of the year. We propose to adjust this upper flow threshold level to 23,000 cfs, with the specification that if inflows are 23,000 cubic feet per second (cfs) or greater, then at least 16,000 cfs would be released. When basin inflows are less than 23,000 cfs but greater than 8,000 cfs, at least 70 percent of basin inflows would be released but not less than 8,000 cfs. This modified operation would provide for controlled releases and storage when flows on the river are at or below 16,000 cfs. This flow threshold is based on an evaluation of spawning and rearing needs for the host fish necessary for mussel reproduction. These adjustments are described in more detail in the enclosed summary and updated IOP table, and should be incorporated into the description of the proposed action that is the subject of our current consultation.

In our March 7 request to initiate formal Section 7 consultation, we previously determined that the IOP at Jim Woodruff Dam for releases to the Apalachicola River during low flow conditions may affect but would not result in jeopardy to the federally-listed threatened Gulf sturgeon, endangered fat threeridge mussel, or threatened purple bankclimber mussel and will not result in the destruction or adverse modification of Gulf sturgeon critical habitat. Nor would the IOP result in the irreversible or irretrievable commitment of resources which would foreclose the development of reasonable and prudent alternatives or measures. We have reviewed the proposed adjustments and clarifications described in the enclosed summary, and conclude that the IOP, as modified, will also not result in the irreversible or irretrievable commitment of resources that would foreclose the development of reasonable or prudent alternatives to avoid jeopardy, or reasonable prudent measures to minimize adverse effects on the listed species or critical habitat.

The IOP was developed based on best available information prior to this spring spawning season for the Gulf sturgeon, including data from monitoring of sturgeon spawning collected during the spring of 2005. It is anticipated that additional monitoring information collected this spring, during extremely dry and lower flow conditions, will be available later this summer. Once this information is available, we intend to review the relationship of flows to available habitat and sturgeon spawning success. Depending upon the timing of the availability of new information and the results of our review, we may propose an amendment to the Section 7 consultation, an extension to the consultation period, or the re-initiation of Section 7 consultation, as appropriate.

We have also learned that a proposal to list additional critical habitat for seven listed mussels was published in the Federal Register on June 6, 2006. The proposed critical habitat includes Unit 8 for the Apalachicola River (96.6 miles upstream from the downstream end of Bloody Bluff Island to Jim Woodruff Dam) for the fat threedridge mussel and the purple bankclimber mussel, which is within the action area of our proposed action. The primary constituent elements for the proposed critical habitat include: (1) a stable stream channel; (2) sand, gravel or cobble bottom substate; (3) flowing water; (4) water quality; and (5) availability of fish hosts. Our proposed operations, as detailed in the IOP, are not expected to adversely impact stream channel stability; nor alter sand, gravel or cobble bottom substrate; or alter water quality. The IOP has taken into consideration the amount of flow necessary for the mussel species. The mussel species occur within the river channel at depths that could be affected at flows less than 8,000 cfs. For flows of 8,000 cfs or less, releases would be made to equal or exceed the computed average basin inflow, and any reductions in releases would be made gradually at rates approximating 0.25 foot per day. When operating in this manner, it was previously determined that any impacts to mussels due to low flow conditions would be due to declining basin inflows rather than due to discretionary operations by the Mobile District, and any flow releases that exceed basin inflow would provide for mitigation of the declining basin inflows. The IOP also provides for adequate flow and water levels for host fish spawning, feeding and resting areas, with respect to available water within the basin, by managing flows during the spring spawning months of March through May. The IOP also provides for at least 70 percent release of basin inflows to accommodate access to habitat areas and gradual ramping rates to minimize potential exposure of fish beds and stranding of fish in adjacent floodplain areas. No significant effect on the primary constituent elements is anticipated due to our operations at Jim Woodruff. Therefore, we conclude that our operations under the IOP are not likely to alter or destroy the primary constituent elements of this critical habitat to the extent that survival or recovery of these species would be appreciably reduced; and that this critical habitat will remain functional to serve its intended conservation role for the species. As such, our operations are not likely to result in the destruction or adverse modification of the proposed critical habitat for the federally-listed mussel species on the Apalachicola River. We request your concurrence in this conclusion and ask that your determination be incorporated into the biological opinion for the ongoing Section 7 consultation.

Please incorporate the enclosed adjustments into the IOP and the description of the action being considered under our request for formal consultation under Section 7. We plan to furnish you the results of our detailed HEC-5 modeling of the IOP for your consideration within the next few days.

If you have any additional questions or need any additional information, please continue to coordinate with Ms. Joanne Brandt by telephone at (251) 690-3260, or by email at joanne.u.brandt@sam.usace.army.mil.

Sincerely,

Curtis M. Flakes, Chief
Planning and Environmental
Division

Enclosures

Revised 12 Jun 2006

U.S Army Corps of Engineers, Mobile District
Interim Operations at Jim Woodruff Dam
and Releases to the Apalachicola River
In Support of Listed Mussels and Gulf Sturgeon

Minimum Releases

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
March - May	>= 37,400	not less than 37,400	Max. known flow of sturgeon spawning in the Apalachicola, as documented in 2005. All of rock shoal inundated by more than 4.59 ft. Majority of floodplain aquatic habitat (61%) in which mussel fish hosts may spawn is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 20,400 and < 37,400	>= 70% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases of at least 70% BI would still provide inundation of at least approximately 87% of the rock ledge habitat and access for spawning (>4.59 ft depth) would be available to approximately 60% of the rock ledge habitat at NM 105.
	< 20,400	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

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Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
June - February	>= 23,000	not less than 16,000	A flow of 16,000 cfs is equivalent to the approximate average monthly flow levels for June – August. The 16,000 cfs flow is important because data indicate that it will provide sufficient flow for host fish necessary for mussel reproduction, as well as provide connectivity between the main channel of the Apalachicola River and back channel and floodplain habitat areas used by mussel host fish as well as young Gulf Sturgeon. At this flow level there are still approximately 7,000 acres of floodplain habitat connected to the river channel. The 16,000 cfs release is equivalent to 70 percent of a basin inflow of 23,000 cfs. There is no flow restriction for excess BI above 23,000 cfs, which allows for storage of the excess flow. This additional storage could be used for other project purposes or as future augmentation flows in support of listed mussels. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 8,000 and < 23,000	>= 70% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would not significantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (in order to store some water from rain events) in order to allow some refill for future augmentation flows. Releases of at least 70% BI and gradual ramping rates would minimize impacts to host fish necessary for mussel reproduction, by maintaining access to remaining off channel habitat areas. Water stored during these conditions would potentially be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
	< 8,000	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Revised 12 Jun 2006

Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~16,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less, but not greater than 1.0 ft/day whenever flows are less than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions. For flows between 20,000 cfs and 30,000 cfs, ramping down from flood peaks for flood control purposes would likely be within a range of 1.0 to 2.0 ft/day.**
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cababilities.
**For flows greater than 30,000 cfs, it is not reasonable or prudent to attempt to control down ramping rate, and no ramping rate is required.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS has recommended the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 16,000 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a minimum percentage of 70 BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% BI release would assure that at least approximately 60% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on spawning habitat or host fish habitat requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

Section 7 Consultation
Jim Woodruff Dam Water Management Operations
Adjustments to the Interim Operations Plan

Use of 7-Day Moving Average for Computation of Basin Inflows and Releases from Jim Woodruff Dam.

Adjustments have been determined to be necessary to manage releases from the dam to meet the specified minimum percent of basin inflows as described in the Interim Operations Plan (IOP). The IOP describes monitoring the 3-day average basin inflows and making releases based on that average. However, due to the logistics of managing flows with the system, there can often be a several day delay, as long as 7 to 10 days, before rainfall received in the upper basin can be moved and released from Jim Woodruff to the Apalachicola River. Additionally, it is often difficult to predict how much the basin inflow will increase for a given rainfall event or how quickly it may fall once a rainfall event has diminished. By using the 7-day average of basin inflows, it provides a smoother transition when making the necessary adjustment to the releases to accommodate the variations in the basin inflows that result following rainfall events. The 7-day average would also allow smoother transitions and more gradual ramping rates which would aid in minimizing the possibility of stranding of sturgeon or other fish, and be protective of mussels, especially during low flow conditions. Model runs have shown that the 7-day average allows for a smoother transition than when the 3-day average is used and helps to minimize the impacts due to excessive use of storage to meet the gradual ramping rates.

Therefore, we plan to use the 7-day moving average in the IOP as a means of making release decisions at Jim Woodruff Dam. It will also be used in conjunction with the volumetric computation described below as the means to determine compliance with the criteria specified at the various thresholds as described in the IOP.

Use of Chattahoochee Gage in Computation of Basin Inflow

The documented variation in the flows between the Woodruff Discharge and the flow at the Chattahoochee Gage on the Apalachicola River may be the result of differences in the estimated turbine and spillway discharge ratings and due to other flow movements beneath the dam that are not readily measurable. Therefore, a revised method of computing the basin inflow is necessary to closely tie the basin inflow computations to actual flow observed at Chattahoochee gage. The computation of the basin inflow will substitute the average daily flow at Chattahoochee gage recorded at midnight in place of the 24-hour average discharge currently recorded at Jim Woodruff Dam. This results in a recomputed local inflow for Woodruff/Chattahoochee that could then be substituted into the overall computations of basin inflow.

Basin Inflow = Local Inflow at Buford + Local Inflow at West Point + Local Inflow at George + Recomputed Local Inflow at Woodruff/Chattahoochee.

Since the Chattahoochee gage is a widely recognized and accepted indicator of flows on the Apalachicola River and is routinely maintained and calibrated by the U.S. Geological Survey, it is recommended that the Chattahoochee gage be used in the computations of basin inflow which will better integrate the Corps operations and computations with an accepted and easily accessed reference point. The Chattahoochee gage will continue to be the reference point for determining the quantity of flows on the Apalachicola River. The Jim Woodruff Powerhouse operators, at the instruction of the Corps Water Management Section, will make the necessary releases to match the specified flows required at the Chattahoochee gage.

Ramping Rates

Another recommendation is that the releases necessary to provide for gradual ramping rates should be considered as part of the computed release in order to avoid over-releases that could adversely impact storage in upstream reservoirs. When basin inflows decline rapidly, as occurs after sporadic rain events or flood pulses, the requirement to make releases with much more gradual ramping rates than the rate of declining basin inflows means more storage would be required to provide the gradual ramping of releases, resulting in the release of more than 100 percent of basin inflow. In order to more closely match releases to basin inflows when managing releases after rain events, the Corps proposes to release less than the peak basin inflow during the rain event (as measured by the 3-day average basin inflow), but use the balance to assist in providing smoother transitions and more gradual ramping rates. This represents more of a volumetric computation of the amount of inflows and releases, rather than trying to follow daily fluctuations in the basin inflows - which is difficult if not impossible to achieve from a system management perspective. As discussed in the earlier paragraph regarding the 7-day average, it is expected that using the 7-day average will minimize the over-releasing and aid in achieving the ramping down rates that are necessary when basin inflows decline. The required volume as computed in relation to the volume of basin inflow would still be released

Another clarification to the IOP is to identify the appropriate ramping rates associated with flood control operations following a rain event, and other threshold values associated with the appropriate gradual ramping rates. The actual ratings for the new turbines at Jim Woodruff Powerhouse is around 16,000 cfs rather than 18,000 cfs, so the IOP table has been revised to reflect a ramping down of flows at rates of 0.25 to 0.5 ft/day when releases are between 8,000 cfs and 16,000 cfs, and at rates between 0.5 and 1.0 for flows between 16,000 cfs and 20,000 cfs. When operating for flood control purposes, releases can usually be made at rates less than 2.0 ft/day when flows are less than 30,000 cfs. It is difficult to ramp down gradually and not prudent to do so (either inconsistent with the flood control purpose or would require excessive storage needlessly) when flows are greater than 30,000 cfs. Therefore, for flood control purposes the IOP table has been revised to reflect a ramping down rate of between 1.0 to 2.0 ft/day for flows between 20,000 cfs and 30,000 cfs (unless a greater rate is necessary under emergency conditions), and no required ramping rate for flows greater than 30,000 cfs.

Volumetric Computation of Basin Inflows and Releases

During consultation discussions, FWS has notedthat it is better for the species to maintain a steady flow for longer periods than to provide for numerous fluctuations in attempts to match the basin inflow exactly. For this reason, as well as for better management of the water resource, it is recommended to use the volumetric method for comparison of inflows to releases.

Due to the lag time between adjustments of the discharge in response to the basin inflows, and to avoid unnecessary short-term fluctuations in releases, it is proposed that a volumetric computation of the basin inflows and releases on the Apalachicola River be maintained on a continuous basis. This would allow the opportunity to compare the volumes of inflows and releases as a means of tracking compliance with the IOP, especially during periods when the goal is to match releases with basin inflows. By tracking the volumes, it will also provide an indication of the magnitude of any temporary imbalance of the volumes which could allow for periodic adjustments to the releases to bring the differences in the volumes closer to 0 percent. The 7-day average would be computed on a continuous running average basis and the volumes would be computed each day. Whenever the difference in volumes exceeds 5%, a readjustment shall be made to the discharges from Jim Woodruff Dam and recorded at the Chattahoochee gage. This readjustment would be consistent with the other requirements of the IOP, such as ramping rates, thresholds, etc. In the event that rebalancing can be done through other operations, such as flood operations or when the basin inflows are at thresholds that require the minimum 70 percent of basin inflows releases, the Corps will make the rebalancing adjustments as necessary.

The intent of the 7-day average, volumetric computation, and readjustments is to compensate for and minimize the potential for over-releasing due to the gradual ramping rates and to allow for any adjustments that will allow the IOP to achieve the goals of each threshold criteria.

Therefore, we plan to maintain volumetric computations of the basin inflows and releases on the Apalachicola River as necessary for compliance at the various threshold levels. In the event that the differences in the volume balances exceed 5 percent, a readjustment will be made consistent with the areas discussed in the previous paragraph, in order to assure that the required flow releases are made (i.e., 100 percent basin inflow, or minimum 70 percent basin inflow, as appropriate.).

Consideration of Jim Woodruff Hydropower Operations

It is proposed to also incorporate into the IOP the existing hydropower generation operation that occurs at Jim Woodruff powerhouse, where releases are temporarily increased for a few hours daily to meet contractual hydropower demands, as described in the enclosed memorandum for record. During this operation, releases may result in a temporary increase in local stages above the base flow release for that day, but releases will not decline below that base release during the day due to this operation. Therefore, the temporary increase in power generation should not significantly affect the ramping rates described in the IOP. The results of this operation can be observed in the daily gage readings for the Chattahoochee gage. Releases made as a result of this operation are included in the volumetric computation of the release for that day, and do not result in a net increase in the volume of releases made from Jim Woodruff Dam.

Adjusted Flow Threshold for Months of June – February

The flow thresholds and operating plan for the months of June – February are intended to be protective of young sturgeon, listed mussels, and host fish for the listed mussels. The 8,000 cfs threshold is based on the flow necessary to fully inundate documented mussel habitat. Flows above 8,000 cfs are considered necessary to assure that host fish necessary for successful reproduction of the listed mussels maintain access to important spawning, rearing and feeding habitats in the off channel and adjacent floodplain areas. Further consideration of operations under the IOP under extended dry conditions have led us to propose an adjusted upper flow threshold for the months of June – February. The IOP submitted in the 7 March request to initiate formal consultation included an upper flow threshold of 37,400 cfs. Excess basin inflow above this threshold could be stored with no restriction; up to 30 percent of basin inflows less than or equal to 37,400 cfs and greater than 8,000 cfs could be stored; and 100 percent of basin inflows would be released for basin inflows of 8,000 cfs or less. We have concern that the flow threshold in the IOP may be overly restrictive and not allow sufficient refill of storage when significant rain events occur during the low flow months, as well as during the winter months of December through February. We have completed a review of average monthly flow data for June through February (see Enclosure 35 to our 7 March letter); the flow needs for potential host fish spawning and nursery habitat in the adjacent floodplain areas during the summer and fall months, as previously provided by the Florida Fish and Wildlife Conservation Commission by letter dated 12 November 2002; and the estimated area of adjacent floodplain connected for various flow levels, as documented by the U.S. Geological Survey (USGS Professional Paper 1594, Aquatic Habitats in Relation to River Flow in the Apalachicola River Floodplain, Florida). Based on this review, we propose adjusting the upper flow threshold to a lower flow level that would still provide for access to floodplain habitat for the potential host fish species necessary for successful reproduction by the listed mussels. We propose to reduce the upper flow threshold value of 37,400 cfs in the IOP for the months of June – February to 23,000 cfs. For basin inflows below 23,000 cfs, a release equivalent to 70 percent of basin inflows would provide for up to 16,000 cfs release during the non-sturgeon spawn portion of the year. There would be no restriction on storage for inflows greater than 23,000 cfs and up to 30 percent of inflow could be stored for flows between 23,000 cfs and 8,000 cfs. The 16,000 cfs flow is important because data indicate that it will provide sufficient flow for mussel host-fish, as well as provide connectivity between the main channel of the Apalachicola River and back channel areas used by mussel host-fish as well as young Gulf Sturgeon. This flow is equivalent to approximately the average monthly flow levels for June – August. At this flow level there is still approximately 7,000 acres of floodplain habitat connected to the river channel; at a flow of 8,000 cfs, there are only several hundred acres of floodplain habitat available. This adjustment to the IOP will allow additional waters to be stored when hydrologic conditions permit. The additional stored water would be used to support federal project purposes and would be available for future augmentation flows as necessary to support the listed mussel species during extended low flow periods. The enclosed preliminary modeling results demonstrate the proposed change and anticipated changes on upstream storage over the period of record for 1939-2001.

The proposed adjustment to the IOP would result in the following operations for June – February:

BI $\geq$ 23,000 cfs, then release at least 16,000 cfs
BI $\geq$ 8,000 cfs and < 23,000 cfs, then release at least 70 percent BI, but not less than 8,000 cfs
BI < 8,000 cfs, then release $\geq$ BI but not less than 5,000 cfs

Future Adjustments to Flow Threshold Values

The current IOP table contains various flow threshold values such as the 37,400 cfs, below which at least 70 percent of basin inflows would be released and 20,400 cfs below which at least 100 percent of basin inflows would be released during the March-May sturgeon spawning period. These flow thresholds represent the range of flows within which sturgeon eggs were collected during the 2005 spawning period. Monitoring of sturgeon spawning success was repeated during this 2006 spring spawning period, which was an extremely dry season, and sturgeon eggs were collected within in a range of much lower flows. We are awaiting the results of this year's monitoring, but propose to re-evaluate the necessary flow thresholds for inclusion in the IOP table once we have the opportunity to review the more recent monitoring data. It is possible the thresholds for releasing at least 70 percent of basin inflows and for releasing 100 percent basin inflows during the spring spawning period could be adjusted downward, if justified by review of the data. We are also completing a computation of the available hard bottom spawning habitat at various flow levels for the upper Apalachicola River. This data could also be used in conjunction with the sturgeon spawning monitoring data to determine the appropriate threshold values. Additional adjustments to the IOP could be made if future continued monitoring demonstrates a need to adjust the operations plan, and/or that the proposed adjustments would still be protective of the Federally-listed species. This would be consistent with adaptive management of the IOP as new information or better data becomes available. In the event a proposed adjustment or change to the IOP is determined to be a significant change, then formal consultation pursuant to Section 7 would be re-initiated. If the proposed modification is determined not to be significant, then the modification could be addressed as an amendment to the Biological Opinion.

CESAM-PD-EI 26 April 2006

MEMORANDUM FOR RECORD

SUBJECT: Jim Woodruff Dam Existing Water Management Operations Section 7 Consultation – Teleconference with U.S. Fish and Wildlife Service on Elements of the Interim Operations Plan

1. A teleconference was held on 25 April 2006 between the U.S. Army Corps of Engineers, Mobile District and U.S. Fish and Wildlife Service (USFWS) to discuss the status of water management operations to implement the Interim Operations Plan, as proposed in the request to initiate formal Section 7 consultation. The intent was to share with USFWS the "lessons learned" to date in attempts to meet the conditions specified in the Interim Operations Plan, to clarify requirements and/or intent of the elements of the Interim Operations Plan, and to assure that there was a common understanding of the definition of and measurement of basin inflows and ramping rates upon which the Interim Operations Plan is based. The Mobile District, also wanted to offer some suggestions for possible adjustments to operations or to consider possible alternative operations methods or measurement tools that would make the Interim Operations Plan more manageable from a project operations perspective while still meeting the needs of the federally-protected species. The following representatives from Mobile District and USFWS participated in the teleconference and discussions.

Jerry Ziewitz	USFWS, Panama City, FL Field Office

OPERATIONS DIVISION REPRESENTATIVES:

Jim Walker	Asst. Chief, Operations Division
Leon Cromartie	Chief, Hydropower Section
Jerry Fulton	Natural Resources Section
Bill Smallwood	Operations Project Manager, ACF Project Office
Richard Johns	Jim Woodruff Dam Powerhouse
Bob Chitwood	Walter F. George Resource Management Office
Bo Ansley	Lake Seminole Resource Management Office
Bill Bond	Lake Seminole Resource Management Office

ENGINEERING DIVISION REPRESENTATIVES:

Memphis Vaughan	Chief, Water Management Section
Cheryl Hrabovsky	ACF Water Manager

PLANNING DIVISION REPRESENTATIVES:

Mike Eubanks	Team Leader, Inland Environment Team
Joanne Brandt	ACF Compliance Manager, Inland Environment Team
Matt Lang	Inland Environment Team

2. Status of Gulf Sturgeon Spawning and Effectiveness of the Interim Operations. Jerry Ziewitz gave a current status of the progress of Gulf sturgeon spawning below Jim Woodruff Dam. Sturgeon eggs have been collected from three spawning locations this year: the previously known spawning site at approximate NM 105 immediately below Jim Woodruff Dam; a second site located on the left descending bank just downstream of the I-10 Hwy bridge; and a third site identified earlier this week on the right descending bank immediately upstream of the I-10 Hwy bridge. Although eggs were collected this week, water temperatures have risen to about 24 degrees centigrade, and spawning activities are expected to be concluding shortly due to the rising water temperatures. Jerry Z. had reviewed the web postings of basin inflows, discharges from Jim Woodruff Dam to the Apalachicola River, and found only one incident where discharges were less than basin inflows when addressed on a weekly time-step. That incident was during the weekend of 21 March, after a large rain event in the upper basin. It was understood by both agencies that releases did not catch back up with the basin inflows for several days after the rain event while waiting for the water to move downstream from the upper basin to the lower basin. Jerry stated he considered the Mobile District water managers were doing a pretty good job at implementing the Interim Operations Plan, and suggested that the longer time-step (i.e., 7-day rather than 3-day average) was probably more appropriate to manage and monitor for consistency with the Interim Operations Plan due to the logistics of managing flows within the system.

3. Measurement of Average Basin Inflows and Releases from Jim Woodruff Dam. Memphis and Cheryl described Mobile District efforts to manage releases from the dam to meet 100 percent of basin inflows by monitoring the 3-day average basin inflows, as described in the Interim Operations Plan, and the difficulties in matching releases to basin inflows over the short-term. There can often be a several day delay, as long as 7 to 10 days, before rainfall received in the upper basin can be moved and released from Jim Woodruff to the Apalachicola River. It is also often difficult to predict how much the basin inflow will increase for a given rainfall event and to anticipate the necessary adjustments to releases to assure that 100 percent will be released over the short timeframe. Another concern was that the gradual ramping rates also must be considered as part of the computed release, and often result in much more gradual ramping rates than the rate of declining basin inflows, which means more storage would be required to provide the gradual ramping of releases. When managing releases after rain events, Mobile District has accordingly often released less than the peak basin inflow during the rain event, but used the balance to assist in providing smoother transitions and the more gradual ramping rates. This represents more of a volumetric computation of the amount of inflows and releases, rather than trying to follow daily fluctuations in the basin inflows - which is difficult if not impossible to achieve from a system management perspective. Jerry Z. noted that there should be a higher priority on providing the smoother transitions and gradual ramping rates in order to prevent standing of sturgeon or other fish, and to be protective of mussels, especially during low flow conditions. It was therefore agreed that the Corps should continue to "smooth" off the peaks of the rain events in order to use the excess basin inflow to provide the more gradual ramping rates following the rain event. Jerry Z. also liked the idea of the 7-day volumetric computation of basin inflows and releases, and recommended it be computed from Wednesday to the next Tuesday (since the Mobile District weekly Water Management meeting is typically on Wednesdays). Computations of inflows and releases and back-casting for consistency would be monitored on the weekly basis, and any adjustments could be made the next week as necessary

to compensate for any shortfall of releases the previous week. Adjustments would typically consist of sustaining releases at a base level for a longer period, increasing releases incrementally if basin inflows had increased, or decreasing releases incrementally if basin inflows had declined. Such a volumetric measurement of inflow versus releases could also be monitored for the entire March through May sturgeon spawning period. Daily water management decisions would then focus on ramping rates for the river and the reservoirs during the fish spawn periods.

Bill Smallwood noted that he had been receiving multiple complaints about rapid declines in Walter F. George Lake levels after rain events, as water was rapidly moved downstream to meet the basin inflow targets on the Apalachicola River. The alternative of managing on a longer time-step, and the volumetric method for computation of basin inflows and releases, would likely minimize fluctuations in river stages, and may also minimize rapid fluctuations in the upstream reservoirs following rain events.

4. Computation and Management of Percentage of Basin Inflows to be Released. The Interim Operations Plan requires a minimum of 70 percent of basin inflows to be released during certain times of the year and certain flow conditions. Similar to the above discussion, this has been difficult to achieve during and immediately following rain events on a short-term basis. Basin inflows may rapidly rise and fall during a rainfall event, but inflows from a rainfall event in the upper basin may take several days to reach the lower basin for release to the Apalachicola River. It was agreed to use the same 7-day volumetric computation as described above when determining the amount of inflows that will be stored and released, and make adjustments in releases as necessary the following week. Any excess storage may therefore be used to assist in augmenting or sustaining flows for longer periods following the rain event.

5. Ramping Rates. The Interim Operations Plan specifies ramping rates of 0.5 ft/day to 1.0 ft/day when flows/releases exceed the capacity of the powerhouse, and 0.25 ft/day to 0.5 ft/day or less when passing flows/releases through the powerhouse. The Interim Operations Plan specified that the powerhouse capacity was 18,000 cfs (capacity of previous turbines); however, it was noted that the capacity of the new turbines was closer to 16,000 cfs (5,500 cfs per turbine). There was much discussion about the difficulties of achieving specific ramping rates at such fine increments as 0.25 ft/day. Although a 500 cfs reduction of flow is generally equivalent to a 0.25 ft reduction in stage at Blountstown, and a 1000 cfs reduction is equivalent to a 0.5 ft reduction at Blountstown, this relationship can be affected by many other factors and is attenuated as you proceed downstream. Generator outflow is based on head differentials at the dam, which can vary with different flow conditions. Lockages can provide additional flow (estimated at 380 cfs per lockage). Efforts to produce a gradual change in stage by switching on and off units or opening trash gates, spill gates or other operations at the dam obviously cannot produce a very precise or predictable change in stage. It was therefore suggested that instead of trying to manage for changes in releases to meet a specific ft/day reduction in stage, water management operations would provide for a specific gradual ramping down of flows, with the understanding that the flow reduction was also equivalent to a gradual reduction in stage (e.g., reduction in flow of 500 cfs per day would be equivalent to an equivalent reduction in stage of 0.25 ft/day as measured at Blountstown gage).

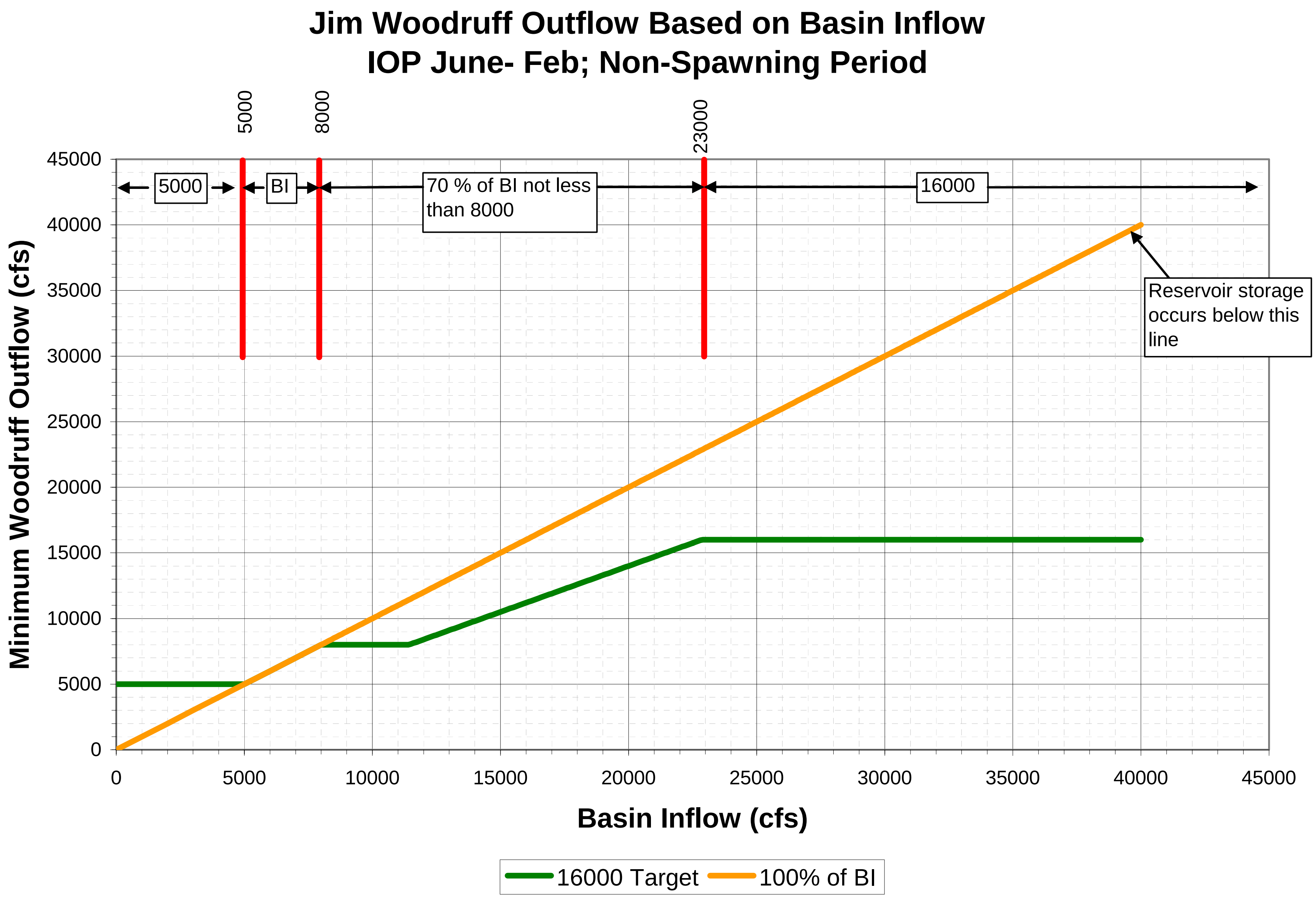
Jerry Z. also recommended that the ramping rates be tied to the Chattahoochee gage rather than the Blountstown gage. Memphis noted that access of the Powerhouse to the Chattahoochee gage data had recently been removed by the U.S. Geological Survey, but that he had already initiated steps to restore access by the Powerhouse to the gage. Jerry also noted that achieving the 0.25 ft/day ramping rates (i.e., 500 cfs reduction in flow) was most important during the lower flow conditions in the upper river, in order to not strand fish and expose mussels. Attenuation of the ramping rates occurs downstream, which means managing for these rates in the upper river by referencing the Chattahoochee gage is the more conservative approach.

6. "Mini-Peaking" Operation at Jim Woodruff Powerhouse. Operations personnel pointed out that there has been for several years a "mini-peaking" operation at Jim Woodruff powerhouse. Under contractual agreements Mobile District has been providing a daily generation schedule of 36 MW for one or two hours a day, typically between the hours of 5:00 p.m. to 6:00 p.m. It is proposed to continue this operation under the Interim Operations Plan. Fluctuations in stage during the "peaking" operation are generally more pronounced during low flow conditions, but appear to be less than one foot as measured from the base flow. During higher flow conditions there may be no peaking if the 36 MW is achieved during normal releases and generation schedules. Jerry Z. stated he had noticed this peaking operation in his previous review of the Chattahoochee gage hourly data, that it represented a temporary spike above the base flow, and was not a severe or long-term fluctuation as in typical peaking plants. Jerry agreed to review the biological literature to see if he can ascertain how the species would react to such short-term fluctuations. He also noted that in computing or monitoring for rates of change on a daily basis, the daily rate of change is generally the average of the hourly rates of change over a 24-hour period compared to the average rate of change for the next 24-hour period.

7. Jerry Z. complimented the Mobile District water managers for their efforts in managing such a complex system to meet the need of the species, and noted that there had been no evidence of problems with Gulf sturgeon spawning this year while implementing the Interim Operations Plan. We agreed that Mobile District should decide on the appropriate management tools for computing the basin inflows and releases and managing ramping rates, based on these discussions and any other pertinent information. Mobile District will provide by official correspondence a description of the proposed adjustments to the operating plan to be considered during the formal Section 7 consultation process. We will then decide how to describe the operation and the appropriate assumptions to be incorporated into the modeling of the Interim Operations Plan. Modeling will be conducted in a team approach between both USFWS and the Mobile District, and will include modeling of the overall Interim Operations Plan on a daily/weekly basis; and some form of modeling to capture the impacts of the "mini-peaking" operation hourly fluctuations. Discussion on modeling efforts are planned to begin next week.

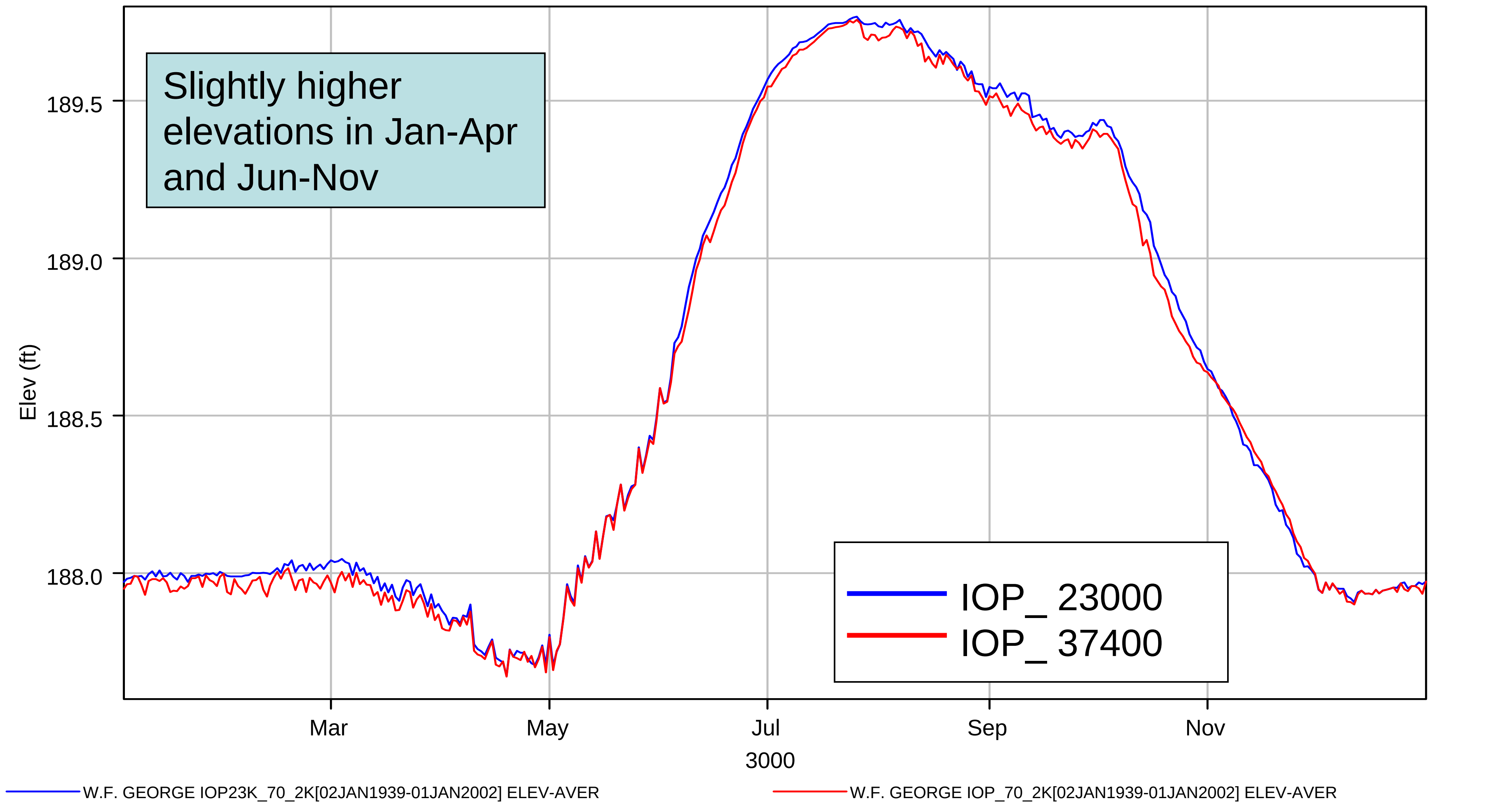
Joanne Brandt

JOANNE BRANDT
Compliance Manager
Inland Environment Team

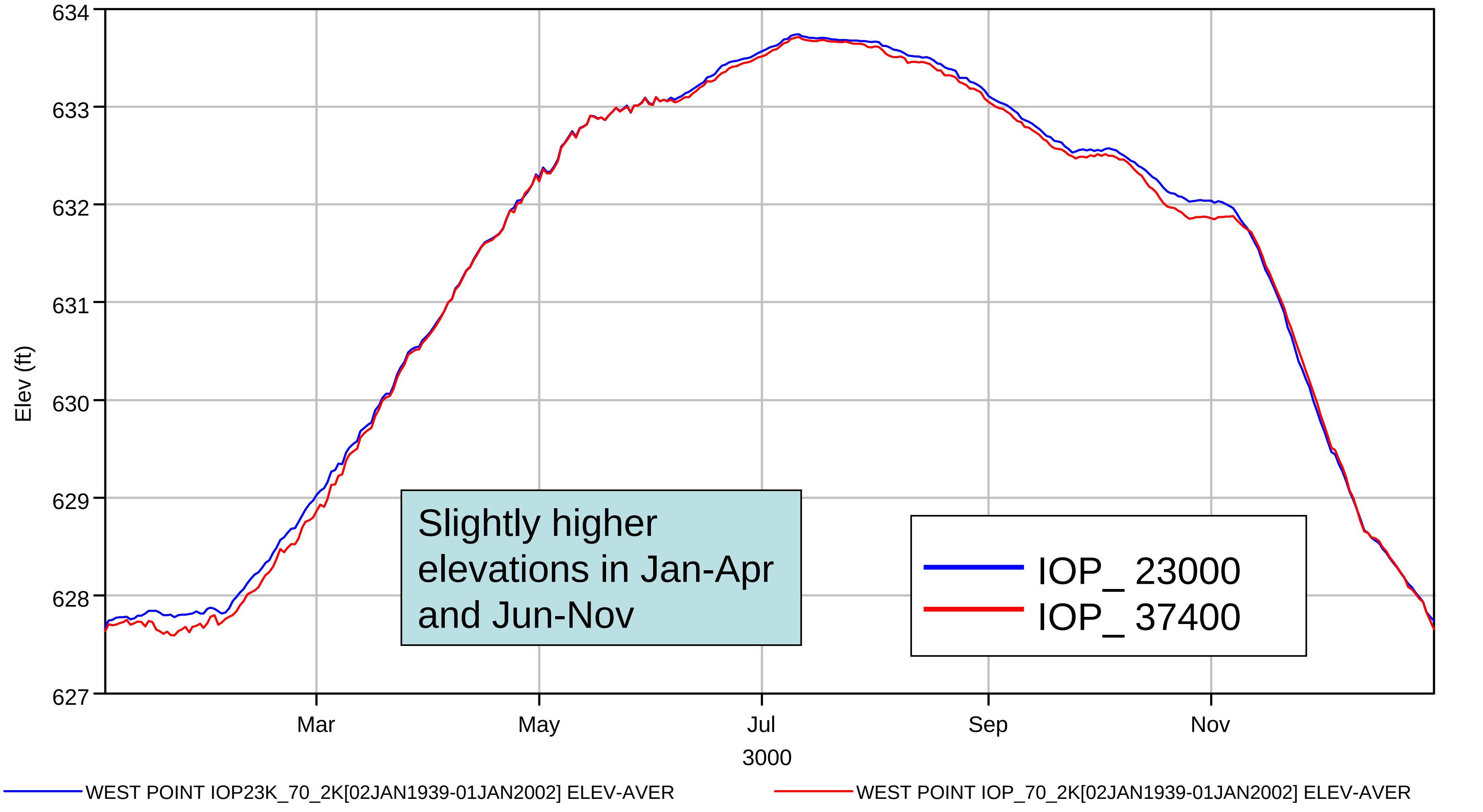


Jim Woodruff Outflow Based on Basin Inflow
IOP June- Feb; Non-Spawning Period
5000
8000
23000
5000
BI
70 % of BI not less than 8000
16000
Reservoir storage occurs below this line
Minimum Woodruff Outflow (cfs)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Basin Inflow (cfs)
16000 Target
100% of BI

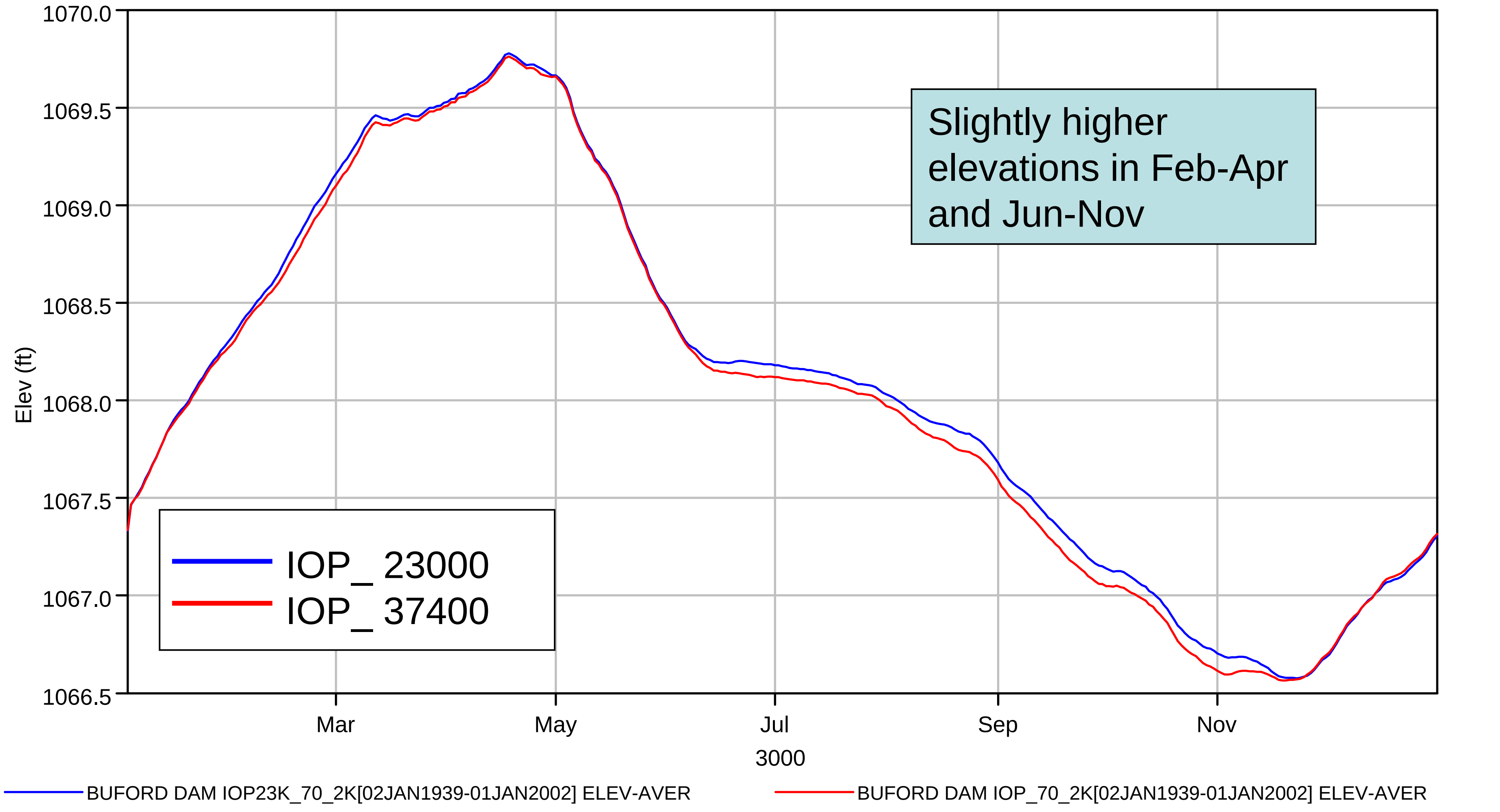
WF George average elevation (1939-2001)



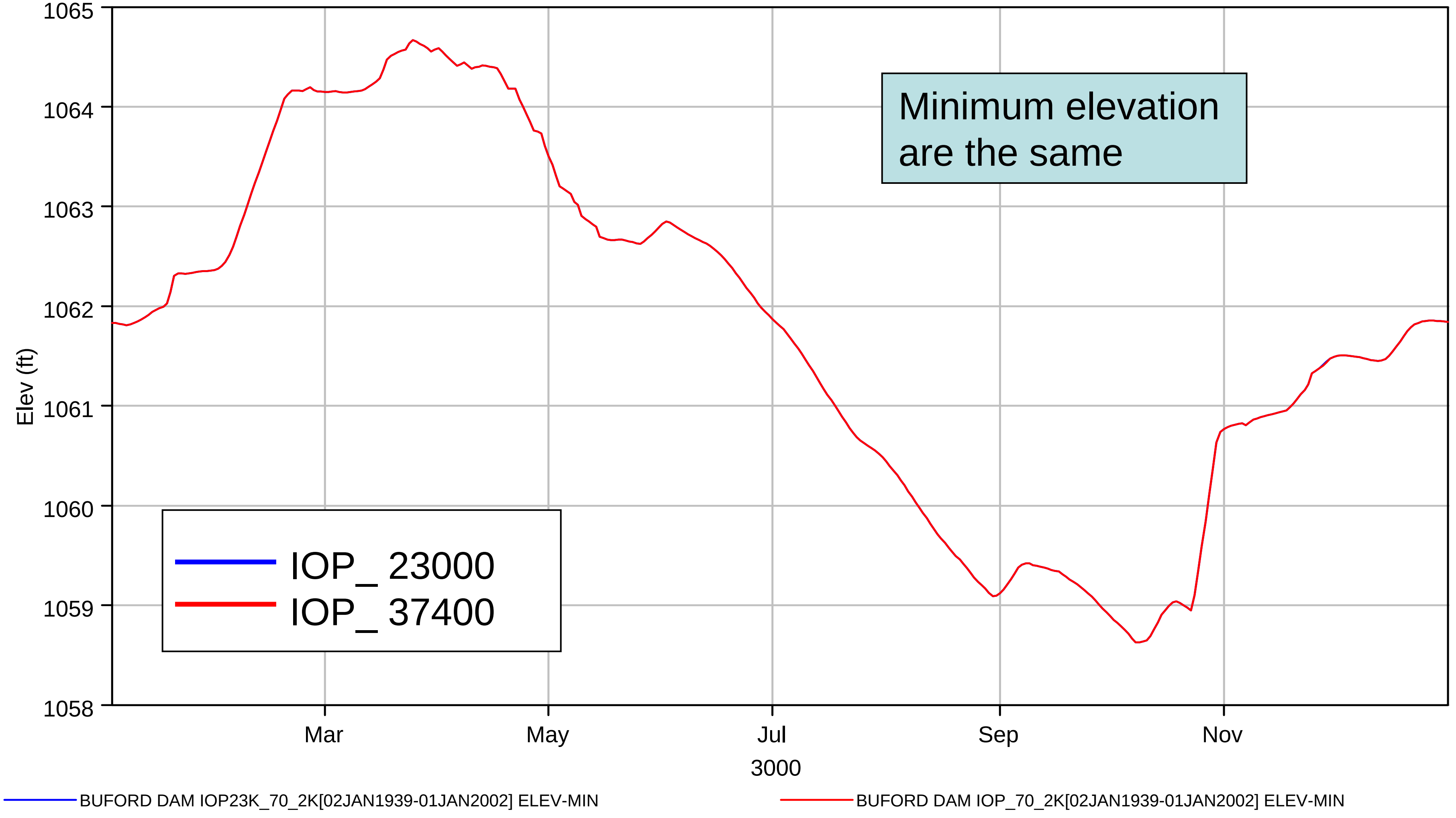
West Point average elevation (1939-2001)



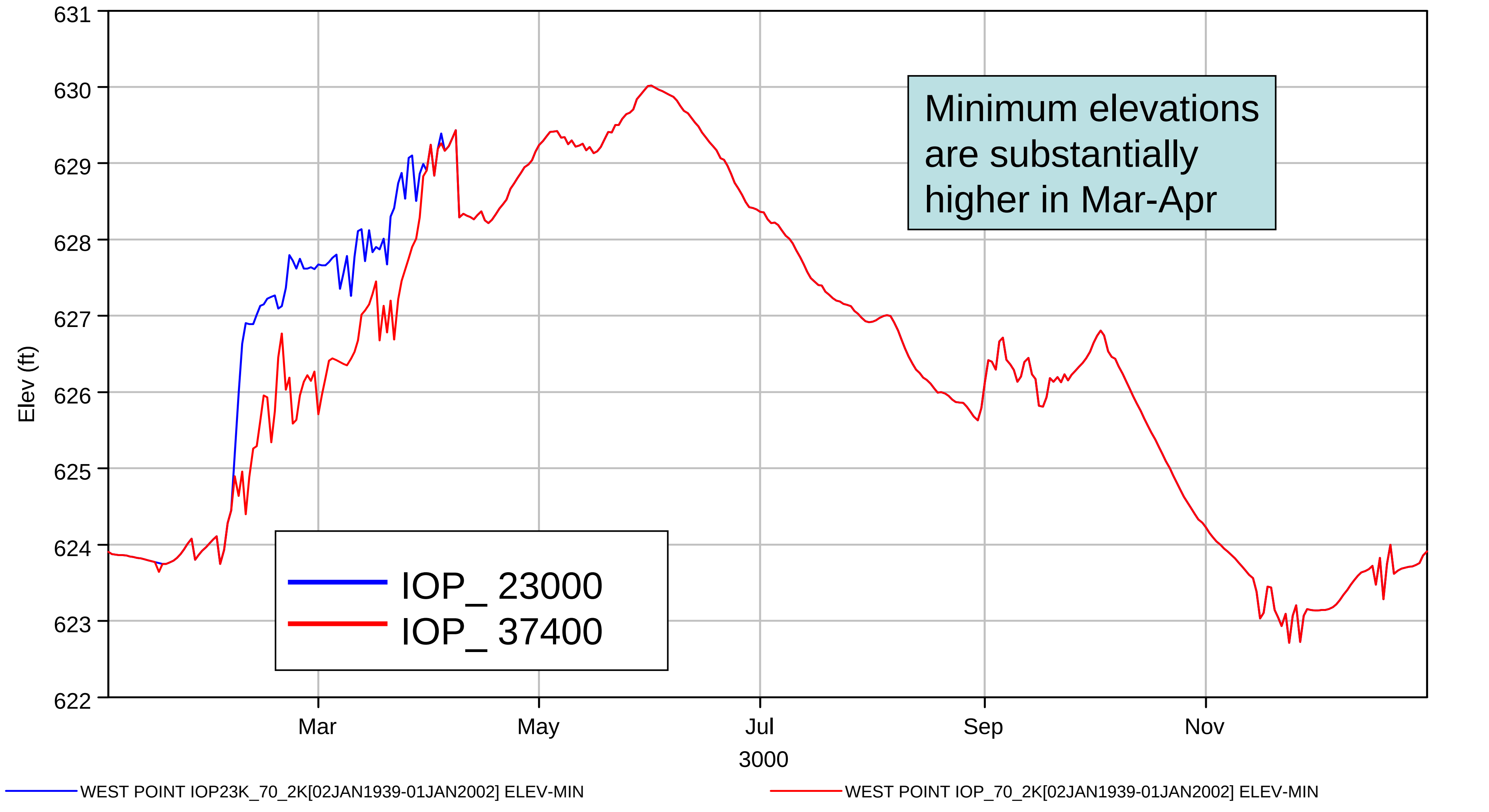
Lanier average elevation (1939-2001)



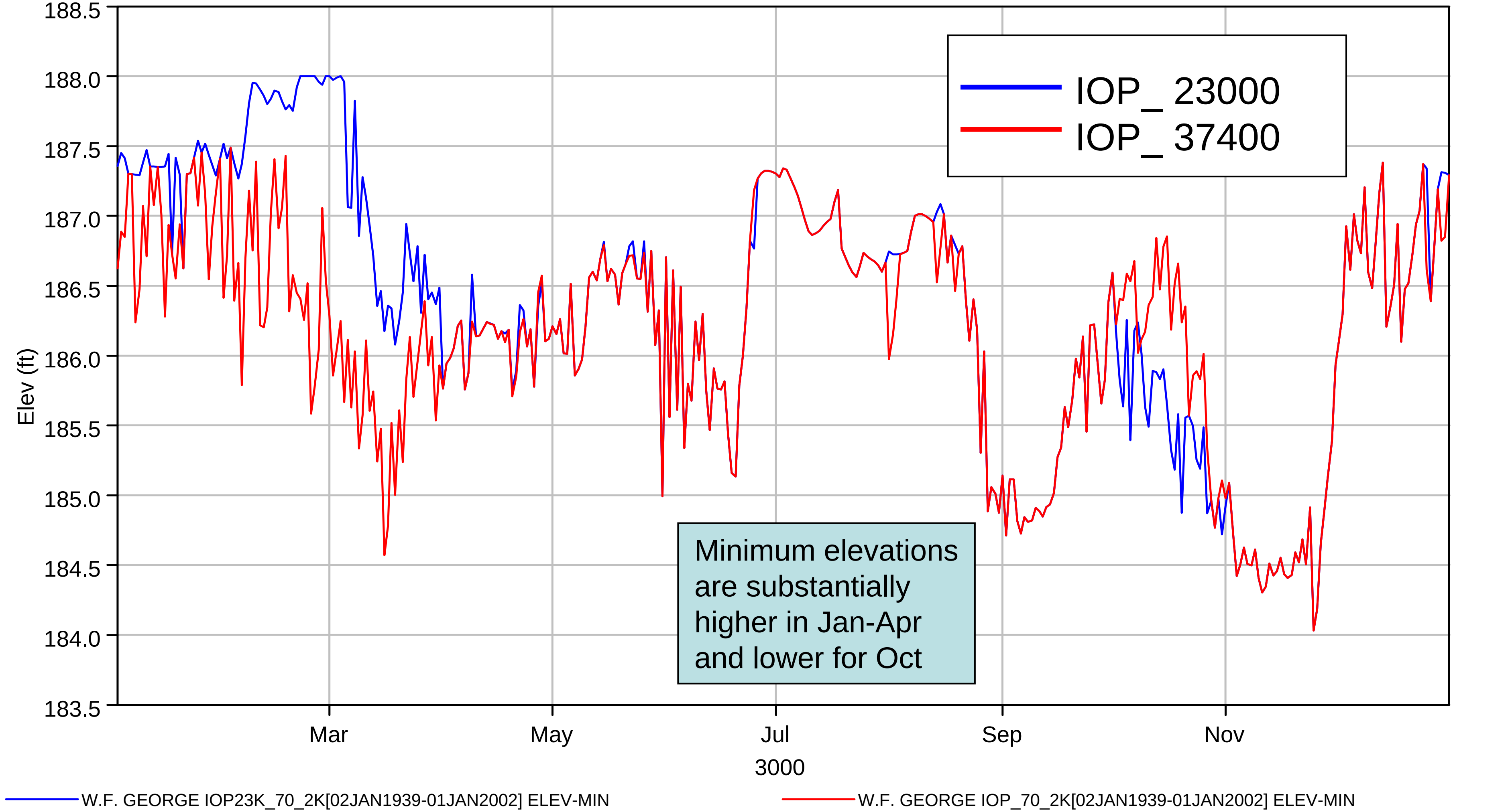
Buford minimum elevation (1939-2001)



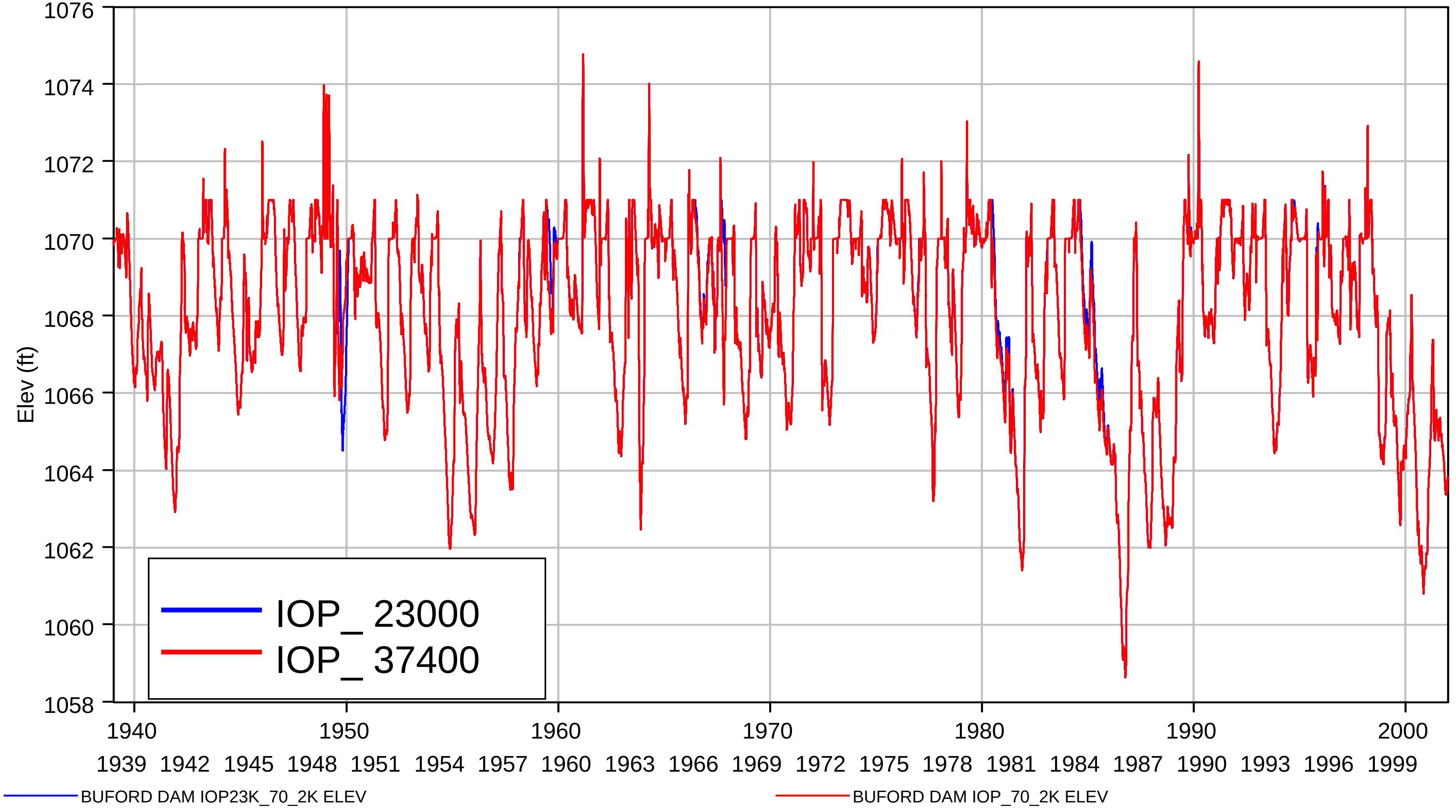
West Point minimum elevation (1939-2001)



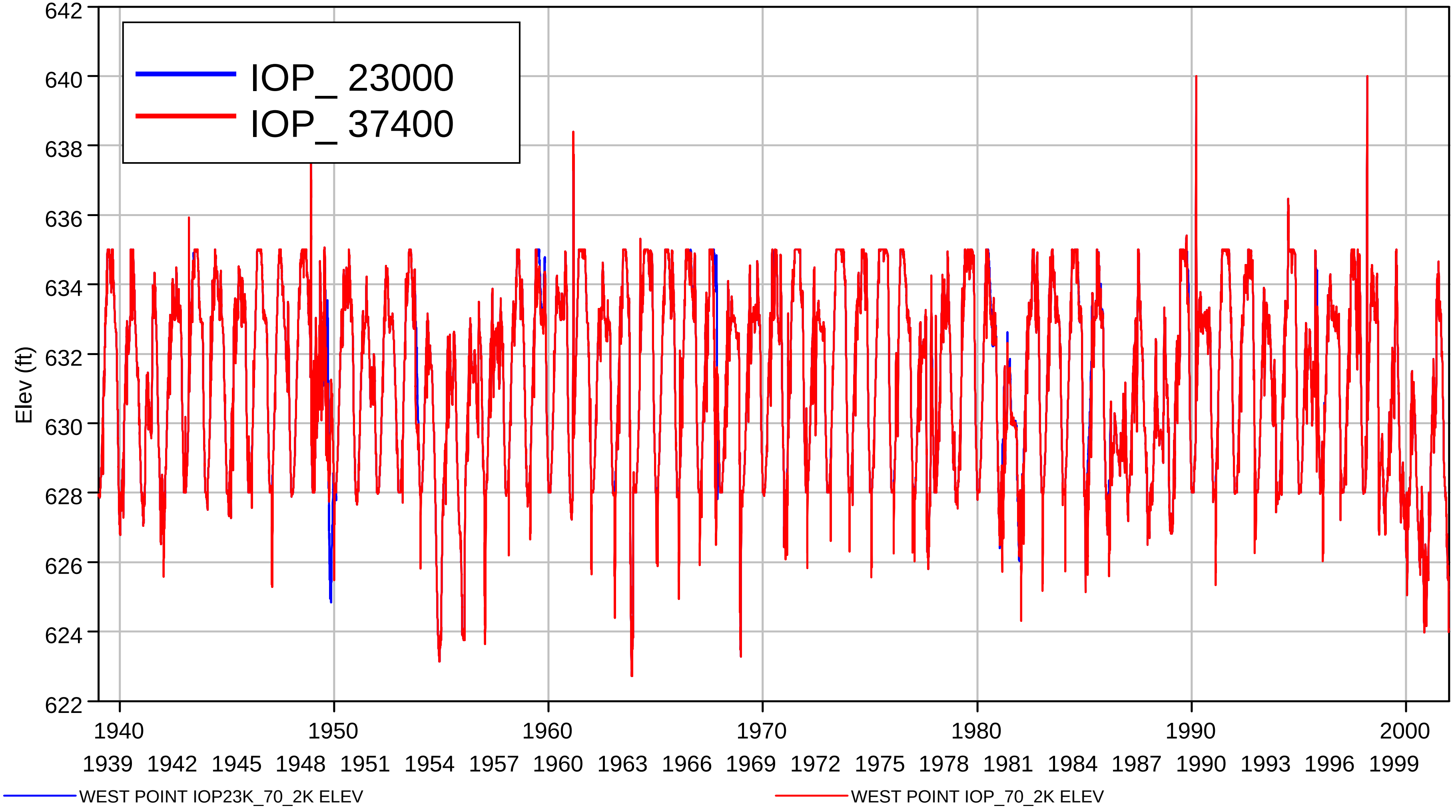
WF George minimum elevation (1939-2001)



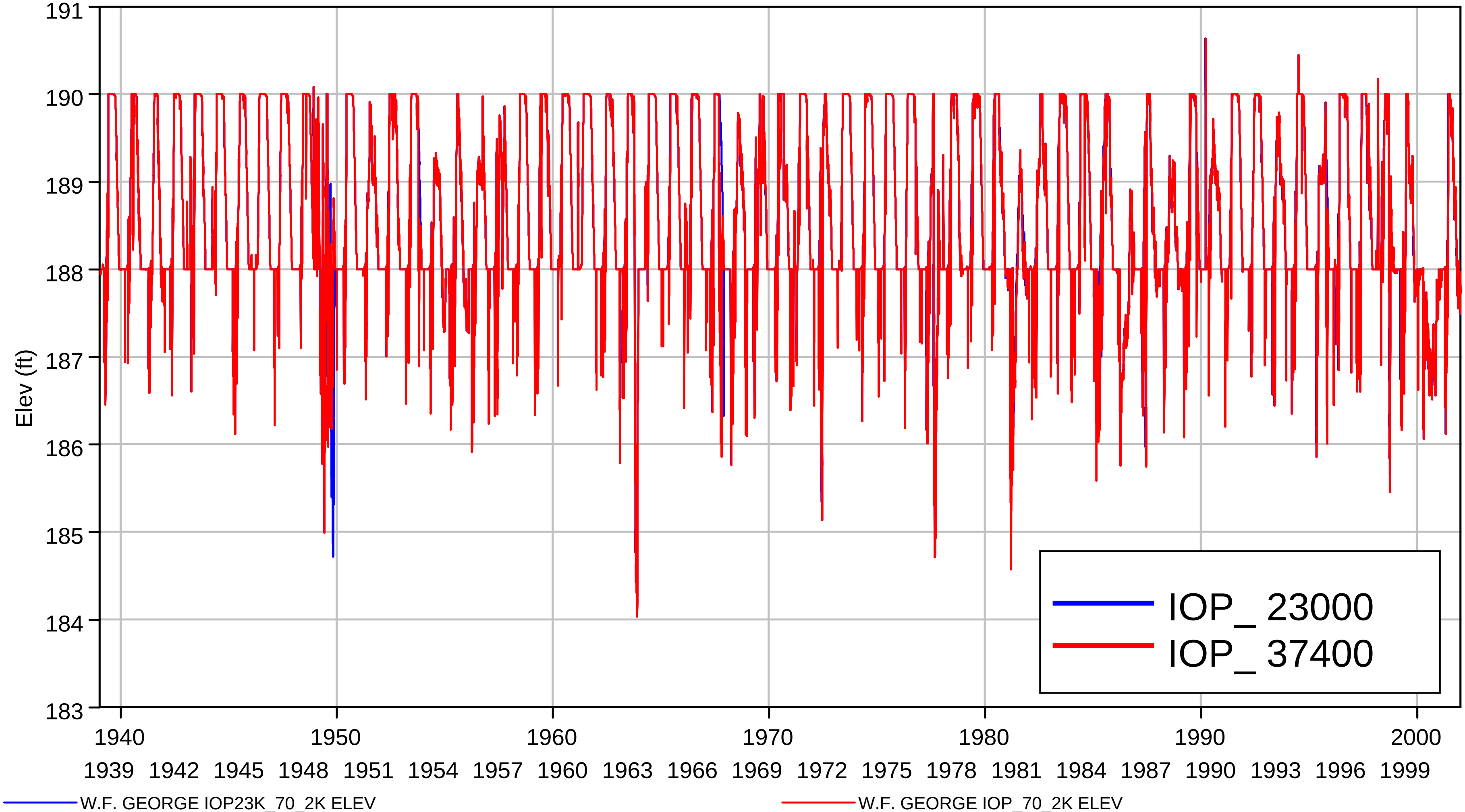
Buford 1939-2001



West Point 1939-2001



WF George 1939-2001



D-6 USFWS letter to CESAM dated 13 June 2006, Request for Extension of Consultation Period

United States Department of the Interior

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

IN REPLY REFER TO:

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

June 13, 2006

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

Re: Jim Woodruff Dam Interim Operations
Calhoun, Franklin, Gadsden, Gulf, Jackson, and Liberty Counties, Florida
FWS Log No. 4-P-06-138

Dear Mr. Flakes:

We have received your letter dated June 12, 2006, which describes various adjustments to, and clarifications of, the Interim Operations Plan (IOP) for water releases from the Jim Woodruff Dam. We shall incorporate these changes into the description of the action in our Biological Opinion (BO). Your letter indicates that we can expect the results of the Corps' hydrologic modeling of the adjusted IOP sometime later this week. We believe we will also receive a preliminary report of data collected by University of Florida researchers on sturgeon spawning activity in the Apalachicola River during 2006 sometime in the next two weeks. In addition, we received a major new study of mussels in the action area from the Florida Department of Environmental Protection on May 21, 2006 (*Freshwater mussel and habitat surveys of the Apalachicola River, Chipola River and selected sloughs/tributaries*. Final Report to FDEP dated May 5, 2006, prepared by EnviroScience, Inc.), which we have shared with the Corps. The Corps' model and these new reports will substantially improve the information base from which we formulate our opinion, but receiving each item relatively late in the consultation process presents an enormous challenge to us. To use this information, we will need to repeat and adjust analyses already completed to reflect the adjustments in the IOP, and we will likely have questions about the information we have yet to receive.

Our formal consultation under section 7 of the Endangered Species Act (ESA) on the IOP began on March 8, 2006. The 90-day statutory period for completing the consultation concluded last week on June 6, 2006, and our biological opinion is due to you by July 21, 2006. When an applicant is not involved in a consultation, as is the case for this consultation, section 7(b)(1)(A) of the ESA and our regulations at 50 CFR §402.14(e) provide that the Service and the action agency may extend the consultation period by a mutually agreeable period of time. Your letter raises the possibility of either re-initiating or extending the consultation to accommodate the adjustments to the IOP and new information about the listed species and their habitats. It will take time to analyse new data and synthesize an opinion. At your request, we shall also incorporate an analysis of IOP effects on the recently proposed critical habitat for the fat threeridge and purple bankclimber (proposed rule, FR 71:32746-32796, June 6, 2006) in this BO. We believe an additional 45 days would provide us sufficient time to make proper use of the new data and accomplish the additional critical habitat analysis.

Therefore, we request a 45-day extension of the consultation period to July 21, 2006, which would make our BO due to you by September 4, 2006. Please let us know as soon as possible whether the Corps agrees to this extension of the consultation period. If not, the Service will prepare the BO based on the best scientific and commercial data that was available to us by June 6.

Sincerely yours,

Gail A. Carmody

Gail A. Carmody
Field Supervisor

JZ/kh/request for time extension.doc

D-7 CESAM letter to USFWS dated 28 June 2006, agreement to extension of consultation period until 5 September and request for conference report on mussel critical habitat

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

JUN 28 2006

REPLY TO ATTENTION OF:

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 June 13, 2006, which requested an extension of the formal consultation period to allow sufficient time to consider the additional information provided by the Corps and others during the consultation period. This letter also confirms that the U.S. Army Corps of Engineers (Corps), Mobile District, has provided additional data for your consideration and incorporation into the biological opinion associated with our water management operations at Jim Woodruff Dam, pursuant to our request to initiate formal Section 7 consultation under the Endangered Species Act.

Our letter dated March 7, 2006 requested the initiation of formal consultation and included an Interim Operations Plan (IOP) summarizing how we planned to operate at Jim Woodruff Dam pending completion of consultation. By letter dated June 12, 2006, Mobile District provided clarifications on how we will monitor and track basin inflows and our releases. We also submitted a proposed adjustment to the flow thresholds for the months of June through February in the IOP. These clarifications and adjustment were proposed in order to improve the efficiency and manageability of our project operations while still meeting the needs of the federally-listed species and critical habitat on the Apalachicola River (the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, the threatened purple bankclimber mussel, and the endangered fat threeridge mussel). We also requested that your agency incorporate our assessment of the impacts of our Jim Woodruff Dam operations on proposed critical habitat for the listed mussel species on the Apalachicola River into the biological opinion (proposed critical habitat was published in the Federal Register on June 6, 2006). On June 19, 2006, we provided updated HEC-5 modeling results depicting the impacts of the adjusted IOP on river flows and reservoir levels within the Apalachicola, Chattahoochee, Flint Rivers (ACF) basin posted at the following FTP site: ftp.//ftp.sam.usace.army.mil/pub/actacf.

We understand that your agency is also awaiting preliminary results from a monitoring study by the State of Florida of Gulf sturgeon spawning success during the 2006 spring spawning season, and that you are completing an assessment of the quantity of Gulf sturgeon habitat by flow, and initiating analysis of additional mussel survey information collected by the State of Florida this spring. Additional information may also be provided by other parties or stakeholders relating to the biological basis for and operations under the proposed IOP.

For your information, the Mobile District has also agreed to host a follow-on modeling workshop to share the results of our HEC-5 modeling of both the original IOP and the adjusted IOP with the technical representatives from the States of Alabama, Florida and Georgia, as well as other interested stakeholders. At this workshop we will describe the biological basis for elements of the IOP, describe the modeling approach, assumptions and settings used by Mobile District to represent both the IOP and the adjusted IOP. A notice will be coming to you in the near future with the time, date, and location for the workshop. Your participation in this workshop is requested. Any relevant information presented or developed at this workshop will be provided to your agency to assist in completing the biological opinion.

We believe that the proposed adjustments to the IOP will improve our ability to effectively operate to meet the needs for the federally listed species and critical habitat. We also agree that our modeling results, as well as the new information provided by the Corps and others, will substantially improve the information base upon which the biological opinion will be based. Therefore, we agree it is appropriate to extend the formal Section 7 consultation period for an additional 45 days. This will extend the date for completion of consultation from the previously agreed to date of July 21, 2006 to the extended date of September 5, 2006.

By this letter we also provide notice that we have modified our current water management operations and releases at Jim Woodruff Dam due to the issuance of a temporary restraining order (TRO) (and subsequent amendments or modifications to the TRO) by the U.S. District Court, Northern Alabama District on June 22, 2006, as a result of litigation filed by the State of Florida. The initial TRO requested that releases be increased to provide a minimum flow of 8,000 cfs at the Chattahoochee gage. Subsequent modifications to the TRO have required us to gradually ramp down flows, beginning on June 23, 2006, by no more than 0.25 foot per day, pending a possible agreement by the States of Alabama, Florida and Georgia on a temporary alternative operation protocol while formal consultation continues. It is our intention for our operations to revert back to the IOP or adjusted IOP once the TRO or any subsequent injunction has been lifted.

We previously determined that the continued operations under the IOP or adjusted IOP would not result in jeopardy to the listed species, or adverse modification or destruction to critical habitat for the listed species. Nor would the continued operations under the IOP or adjusted IOP result in the irreversible or irretrievable commitment of resources which would foreclose the development of reasonable or prudent alternatives to avoid jeopardy, or reasonable prudent measures to minimize adverse effects on the listed species or critical habitat. We also previously concluded that our operations under the IOP or adjusted IOP are not likely to alter or destroy the primary constituent elements of proposed critical habitat for the listed mussel species to the extent that survival or recovery of these species would be appreciably reduced; and that this critical habitat will remain functional to serve its intended conservation role for the species.

As such, our operations under the IOP or adjusted IOP under the extended consultation period are not likely to result in the destruction or adverse modification of the proposed critical habitat for the federally-listed mussel species on the Apalachicola River. We also note your previous guidance that a conference report would be prepared to address the potential for impacts to the proposed critical habitat, which indicates a determination of no jeopardy to the species or no adverse modification to proposed critical habitat. We request your concurrence with our conclusions and ask that your determination be incorporated into the biological opinion for the ongoing Section 7 consultation.

If you have any questions regarding our consultation or the information provided to date, please feel free to contact Ms. Joanne Brandt of the Inland Environment Team, (251) 690-3260, or Email: joanne.u.brandt@sam.usace.army.mil. We look forward to continued progress as we work with you and your staff to complete our respective consultation responsibilities.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

D-8 CESAM letter to Trey Glenn, Alabama Department of Environmental Management (ADEM) dated 15 May 2006, invitation to 24-25 May 2006 Hydrological Modeling Technical Workshop

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

REPLY TO
ATTENTION OF

MAY 1 5 2006

Inland Environment Team
Planning and Environmental Division

Mr. Trey Glenn, Director
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

Dear Mr. Glenn:

On March 7, 2006, the U.S. Army Corps of Engineers (Corps) submitted a request to the U.S. Fish and Wildlife Service (USFWS) to initiate formal Section 7 consultation under the Endangered Species Act regarding our water management operations at Jim Woodruff Dam. While consultation discussions proceed, we have been operating under an Interim Operations Plan, which was included in the request to initiate formal consultation.

The Corps is continuing discussions with the USFWS concerning the formal Section 7 consultation process. As part of these discussions, we are addressing the impacts of the Interim Operations Plan. In order to assess these impacts, we plan to conduct hydrological modeling of the Interim Operations Plan, which will also address potential adjustments to the plan if determined necessary. Both agencies want to assure we are using the most appropriate modeling tools and best scientific information available to assist in completing a biological opinion, and that it would be helpful to confer with others with technical modeling expertise. The Corps and USFWS have therefore scheduled a modeling workshop to be held on May 24-25, 2006, at the Lake Seminole Resource Management Office near Chattahoochee, Florida. The purpose of the workshop will be to assure that there is a common understanding of the elements of the Interim Operations Plan, what it is intended to achieve, and what can be expected to be observed in real time operations when implementing the Interim Operations Plan. The technical group would then assure that the appropriate modeling assumptions, tools, and procedures are selected and implemented to portray the impacts of the Interim Operations Plan or any alternative operations procedures as accurately or closely as possible.

By this letter, we are extending an invitation to the State of Alabama to provide technical representation at the workshop scheduled for May 24-25. The workshop will be scheduled to begin at 10:00 a.m. central daylight time (11:00 a.m. eastern daylight time) on Wednesday, May 24; and should conclude by noon on Thursday, May 25. We are inviting technical representatives from the states of Alabama, Florida, and Georgia to attend this workshop. We only request that attendance at the workshop be limited to technical representatives and that no attorneys be present. Please notify Ms. Joanne Brandt, Corps Inland Environment Team, of your acceptance of this invitation and provide her with the names of the representatives who plan to attend so we will know who to expect at the workshop. She can be reached by telephone at (251) 690-3260 or by email at: joanne.u.brandt@sam.usace.army.mil.

Sincerely,

for

Peter F. Taylor
Colonel, Corps of Engineers
District Commander

D-9 ADEM-Glenn letter to CESAM dated 12 June 2006

ADEM

ALABAMA DEPARTMENT OF ENVIRONMENTAL MANAGEMENT
POST OFFICE BOX 301463 36130-1463 • 1400 COLISEUM BLVD. 36110-2059
MONTGOMERY, ALABAMA
WWW.ADEM.STATE.AL.US
(334) 271-7700

ONIS "TREY" GLENN, III, P.E.
DIRECTOR

BOB RILEY
GOVERNOR

Facsimiles: (334)
Administration: 271-7950
General Counsel: 394-4332
Communication: 394-4383
Air: 279-3044
Land: 279-3050
Water: 279-3051
Groundwater: 270-5631
Field Operations: 272-8131
Laboratory: 277-6718
Mining: 394-4326

June 12, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

Dear Colonel Taylor:

I am writing in response to the correspondence between representatives of the Corps and representatives of the State of Georgia with regard to the Interim Operations Plan ("IOP") and its potential effects on the reservoirs in the Apalachicola-Chattahoochee-Flint Basin ("ACF Basin").

In the correspondence, Georgia has indicated that its models suggest that adherence to the IOP will create a dire, unprecedented situation for the ACF reservoirs. Alabama has undertaken a review of Georgia's models and the Corps' models, and we believe that Georgia's analysis turns on certain assumptions that differ from the Corps' apparent assumptions for implementing the IOP. In fact, the input used in the two models varies so greatly that a meaningful comparison is virtually impossible. This highlights the need for all parties to work together to assure that the assumptions being made by all parties are clearly understood.

I also want to call your attention to the continuing failure of the Corps to maintain a balance among the ACF reservoirs so that they are all operating in the same zone at the same time. The IOP itself states that the Corps will balance the reservoirs in this manner, and the Corps' website indicates the same intent. However, the actual operations indicate a continuation of the historical pattern of the Corps favoring Lake Lanier over the downstream reservoirs. Currently, Lake Lanier is operating in Zone 1, while Lake Eufaula is operating in Zone 3. This imbalance must be remedied by the Corps immediately.

According to the data on your website as of June 9, 2006, Lake Lanier had 90% of the storage remaining while Lake Eufaula only had 50% of its storage remaining. This imbalanced operation plus the sudden fluctuations in Lake Eufaula's elevations have a major impact on Alabama. These can include impacts to the fish spawn in the reservoir.

Also, could you please clarify the statement made by Pat Robbins of your office that was quoted in an article in the Atlanta Journal Constitution on June 8, 2006? The quote is as follows: "Our priorities are water supply, water quality and endangered and threatened species." This concerns me since it ignores hydropower and navigation. The United States Court of Appeals

Birmingham Branch
110 Vulcan Road
Birmingham, Alabama 35209-4702
(205) 942-6168
(205) 941-1603 [Fax]

Decatur Branch
2715 Sandlin Road, S.W.
Decatur, Alabama 35603-1333
(256) 353-1713
(256) 340-9359 [Fax]

Mobile Branch
2204 Perimeter Road
Mobile, Alabama 36615-1131
(251) 450-3400
(251) 479-2593 [Fax]

Mobile – Coastal
4171 Commanders Drive
Mobile, Alabama 36615-1421
(251) 432-6533
(251) 432-6598 [Fax]

for the Eleventh Circuit ruled in 2005 that hydropower, navigation, and flood control are the purposes for which Lake Lanier was authorized. That conclusion was consistent with the Corps' internal legal analysis prepared by Mr. Stockdale in 2002.

Finally, I note that Dr. Couch in her letter of June 9 asked that the Corps make a final decision about Georgia's requested revisions to the IOP by June 12, 2006. That timetable is wholly unrealistic.

Alabama agrees with Georgia that there has been an inadequate time period for the views of the three States to be obtained concerning the Endangered Species Act consultation between the Corps and the Fish and Wildlife Service, as well as the intended operations under the IOP. That is why Alabama requested an extension of time to provide comments, and we renew that request. We think that much of the concern that exists about the IOP can be alleviated through the provision of more information by the Corps. Alabama therefore requests that the Corps convene a meeting of the key personnel from the three States as soon as possible so that the Corps can explain in detail how it intends to operate the ACF reservoirs under the IOP if dry conditions persist or worsen this summer. A complete assessment of the effects of the IOP requires that this additional information be provided.

I look forward to your prompt response to this letter.

Very truly yours,

Onis "Trey" Glenn, III

OTG/ghe

cc: Carol Couch, Georgia Department of Natural Resources
Colleen Castille, Florida Department of Environmental Protection

Alabama Department of Environmental Management

1400 Coliseum Boulevard
Montgomery, Alabama 36130-1463
Phone: 334-271-7710
Fax: 334-279-3043
E-mail: director@adem.state.al.us

Fax Transmittal Form

To: Colonel Peter Taylor Mobile District, Corps of Engineers Fax #: 251-690-2525	From: Trey Glenn Date sent: 06/12/06 Time sent: 3:30 p.m. Number of pages including cover: 3

___ Urgent ___ For Review ___ Please Comment ___ Please reply

Message:

Original letter will be mailed today.

D-10 CESAM letter to ADEM-Glenn dated 7 July 2006, response to 12 June 2006 letter and invitation to follow-on Hydrological Modeling Technical Workshop

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

REPLY TO
ATTENTION OF:

JUL - 7 2006

Inland Environment Team
Planning and Environmental Division

Mr. Onis "Trey" Glenn, III
Director
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

Dear Mr. Glenn:

I have received your letter dated June 12, 2006, regarding modeling conducted by the U.S. Army Corps of Engineers (Corps) and the State of Georgia and our operations under the Interim Operations Plan (IOP) submitted with our request to the U.S. Fish and Wildlife Service (USFWS) for formal consultation under the Endangered Species Act of 1973. Modeling of the IOP is being conducted by the Corps and the USFWS to address the potential impacts of our water management operations at Jim Woodruff Dam and releases to the Apalachicola River on federally-listed species and critical habitat (the threatened Gulf sturgeon, critical habitat for the Gulf sturgeon, the endangered fat threeridge mussel, the threatened purple bankclimber mussel, and proposed critical habitat for the listed mussel species). In order for comparisons to be made of the results produced from various modeling efforts, we agree that there should be consistency in the assumptions used in the models. In order to assist in assuring that modeling of the IOP incorporates the appropriate modeling approaches and assumptions, the Corps and the USFWS jointly hosted a technical workshop on May 24-25, 2006. Technical representatives from each of the States of Alabama, Florida and Georgia were invited to participate in the workshop and we appreciate your participation.

At the workshop, we invited comments and suggestions to assure that modeling conducted by the Corps, USFWS and others would accurately reflect the IOP and Corps operations. We asked that discussion not focus on elements of the IOP but on how the IOP should be modeled. During the workshop, USFWS also described the regulatory requirements and schedule for completion of formal consultation. Comments on the environmental flow needs of the protected species and impacts of the Corps operations were solicited separately by USFWS from State fish and wildlife agencies, and other public, private or commercial sources as part of the formal consultation process. By law, the Final Biological Opinion must be completed within a 135-day period or July 21, 2006, unless the Corps and USFWS mutually agree to an extension. This timeframe is comprised of 90 days of formal consultation, during which information is gathered and consultation discussions occur; and an additional 45 days for USFWS to complete the Biological Opinion. By letter dated June13, 2006, the USFWS requested a 45-day extension of the consultation period. We have reviewed their request and agree that it is appropriate to extend the formal consultation period for an additional 45 days to September 5, 2006. We have responded to the Service by letter and also informed the Court of this development.

While operating under the IOP this spring we have identified several "lessons learned" and have asked the U.S. Fish and Wildlife Service (USFWS) to evaluate proposed adjustments to the IOP that could minimize unintended impacts on project operations and improve our ability to manage releases from Jim Woodruff Dam to meet the needs of the federally listed species as well as our authorized purposes. These proposed adjustments include the method for computing basin inflows to manage releases under the IOP (using a seven-day average basin inflow rather than a three-day average); tying computations of basin inflows and releases to the Chattahoochee gage; clarifying threshold flows for ramping rates associated with flood control operations; clarifying how releases for gradual ramping rates are captured in the volumetric computation of releases to meet the volumetric computation of basin inflows; and a lowering of the upper flow threshold for the months of June through February which would allow for additional storage under certain conditions. In addition to inquiring about changes we have made to the IOP, you also suggested several specific changes be made to the IOP. Under separate cover, we have provided all three States the IOP, the revised IOP, and all of the modeling data. We have also scheduled another workshop to explain the IOP, the revised IOP, and our modeling approach. The workshop will be held on July 12, 2006, in Columbus, Georgia. We will take your current comments and any future comments into consideration in deciding upon any other revisions.

The remainder of your comments relate to project operations, anticipated impacts, and suggested changes to the IOP. I have been advised that any comments on the IOP, or proposed changes to the IOP or consultation schedule should be handled through the ongoing mediation discussions between the Corps and the States of Alabama, Florida and Georgia. Therefore, the Corps mediation representative, Ms. Karen Durham-Aguilera, will provide any formal response to your concerns, if necessary, pending the results of her discussions with the parties involved with the mediation.

Thank you for your assistance.

Sincerely,

Peter F. Taylor, Jr.
Colonel, Corps of Engineers
District Commander

Copies Furnished:

Mr. Onis "Trey" Glenn, III
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Post Office Box 301463
Montgomery, AL 36130-1463

Mr. Stan Cook
Chief of Freshwater Fisheries and Wildlife Division
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64 North Union Street
Montgomery, AL 36130

Ms. Colleen M. Castille
Secretary, Florida Department of Environmental Protection.
Marjory Stoneman Douglas Building
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Tallahassee, FL 32399

Mr. Ken Haddad, Executive Director
Florida Fish and Wildlife Conservation Commission
620 South Meridian Street
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Dr. Carol Couch
Director, Environmental Protection Division
2 Martin Luther King Jr. Drive, SE
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Mr. Dan Forster, Director
Game and Fish Division
Georgia Department of Natural Resources
2070 U.S. Hwy 278, SE
Social Circle, GA 30025

Ms. Karen Durham-Aguilera,
U.S. Army Corps of Engineers, Northwestern Division,
Post Office Box 2870
Suite 500
Portland, OR 97209-4141

D-11 Florida Department of Environmental Protection (FDEP)-Castille letter to CESAM dated 9 March 2006, requesting formal consultation be initiated

FLORIDA DEPARTMENT OF ENVIRONMENTAL PROTECTION

Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

March 9, 2006

Col. Peter F. Taylor, Jr.
Department of the Army
Mobile District, Corps of Engineers
Attention: CESAM-DE
Post Office Box 2288
Mobile, Alabama 36628-0001

RE: Gulf Sturgeon Flow Demands

Dear ~~Col. Taylor~~ Col. Taylor,

The State of Florida has sought a preliminary injunction from the United States District Court of Alabama requiring the Army Corps of Engineers ("Corps") to consult formally with the Fish and Wildlife Service pursuant to Section 7 of the Endangered Species Act ("ESA"). The purpose of Florida's injunction motion is to ensure that the Corps' Apalachicola-Chattahoochee-Flint River system operations comply with the ESA, which obligates the Corps, among other things, to avoid jeopardizing the Gulf sturgeon or adversely modifying its designated critical habitat in the Apalachicola River.

In response to Florida's motion, Corps counsel noted the absence of "any particular threat to spawning habitat that will arise before April 2006." *Alabama v. U.S. Army Corps of Eng'rs.*, CV-90-BE-01331-E (N.D. Ala.), Federal Defendants' Opposition to Intervenor/Plaintiff Florida's Motion to Expedite (filed 02/03/06). Nevertheless, the Corps' current projections indicate that, by March 15, 2006, releases from Jim Woodruff Lock and Dam will drop to 15,000 cubic feet per second ("cfs") with reservoir levels remaining stable. *See* http://water.sam.usace.army.mil/. Releases as projected will adversely modify designated Gulf sturgeon critical habitat and compromise Gulf sturgeon spawning by failing to provide sufficient depth of water over known spawning sites below Jim Woodruff Lock and Dam. *See Designation of Critical Habitat for the Gulf Sturgeon; Final Rule*, 68 Fed. Reg. 13,370, 13,382 ("The minimum depth at which Gulf sturgeon eggs have been collected is 1.4m (4.6 ft).") (Emphasis supplied).

Florida, moreover, consistently has objected to the Corps' retention of water in upstream reservoirs for the benefit of municipal, industrial and recreational uses at the expense of the Gulf sturgeon and other threatened and endangered species in the Apalachicola River.

While water flowing to the Apalachicola River is reduced, water levels in Lake Lanier and other upstream reservoirs remain near the top of the conservation pool. That water is available for release to benefit the Gulf sturgeon, which, as the Fish and Wildlife Service last year confirmed, will spawn below Jim Woodruff Lock and Dam, (approx. River Mile 105.3) provided adequate water is available.

Although the Corps apparently does not accept Florida's legal contention that the Corps is required to consult formally on its dam and reservoir operations, that issue currently is subject to judicial review. Until the parameters of the Corps' ESA-based obligations are set, the ESA requires that the Gulf sturgeon receive the benefit of any doubt. *Florida Key Deer v. Stickney*, 864 F. Supp. 1222, 1241 (S.D. Fla. 1994) citing *Tennessee Valley Authority v. Hill*, 437 U.S. 153, 174 (1978). Accordingly, Florida demands that the Corps provide sustained releases from Jim Woodruff Lock and Dam sufficient to support Gulf sturgeon spawning activities and to avoid any adverse modification of critical habitat until the pending litigation is resolved.

It is the Corps' obligation, in consultation with the Fish and Wildlife Service, to determine the specific flow required to avoid a violation of the ESA, *see* 16 U.S.C. § 1536(a)(2). Until that consultation is conducted, however, the Corps should release from Jim Woodruff Lock and Dam not less than 22,000 cfs from March 15, 2006 until the Gulf sturgeon spawn is complete. *See* 68 Fed. Reg. at 13,383 (explaining that flows of 21,610 cfs are necessary to inundate completely the Gulf sturgeon spawning site).

Thank you for your anticipated cooperation.

Sincerely,

Colleen M. Castille

Colleen M. Castille
Secretary

D-12 CESAM letter to FDEP-Castille dated 21 March 2006, responding to 9 March 2006 letter

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

March 21, 2006

REPLY TO
ATTENTION OF:

Office of Counsel

Colleen M. Castille, Secretary
Florida Department of Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Dear Ms. Castille:

I am in receipt of your March 9, 2006 letter requesting sustained releases from Jim Woodruff Lock and Dam to support Gulf sturgeon spawning activities and to avoid adverse modification of the species' critical habitat. A copy of your letter is enclosed for your reference. I appreciate Florida's concern for the continued conservation of the threatened Gulf sturgeon. I can assure you that the Mobile District is also committed to ensuring the Gulf sturgeon's conservation by conducting current water management operations at the Jim Woodruff Lock and Dam in compliance with the Endangered Species Act (ESA).

Pursuant to our responsibilities under Section 7 of the ESA, Mobile District has informally consulted with the U.S. Fish and Wildlife Service (USFWS) and the Florida Fish and Wildlife Conservation Commission (FWCC) over the past few years regarding our operations at Jim Woodruff Dam during low flow conditions and to assure adequate water is released in support of Gulf sturgeon and other fish spawning activities. As a result of our informal consultation discussions, additional data has been gathered to define the Gulf sturgeon spawning habitat characteristics and flow requirements during spawning activities.

Based on our evaluation of recent data on the bathymetry of hard bottom spawning habitat located at approximate Navigation Mile (NM) 105, a flow release approximating 30,000 cfs would provide for inundation of the entire habitat area to a depth of approximately 4.6 feet. USFWS has previously indicated that this is the minimum depth at which Gulf sturgeon spawning has been documented at other river locations. During monitoring of this area in the spring of 2005, USFWS documented successful spawning by Gulf sturgeon at flows ranging from 20,400 cfs to 37,400 cfs. At flows of 20,400 cfs, the entire rock ledge habitat at NM 105 is fully inundated and approximately 74 percent of the spawning habitat area is inundated to a depth of approximately 4.6 feet. During informal consultation discussions it was acknowledged that releases necessary to fully inundate the rock ledge habitat area at NM 105 throughout the March through May potential spawning period cannot normally be maintained, especially for spring months that are drier than normal. For example, a review of historical hydrological conditions for the period 1929 through 2004 indicates that 22 percent of the days in March, 35 percent of the days in April, and 64 percent of the days in May experienced flows less than 21,000 cfs. For the month of May, 50 percent of the days experienced flows less than 18,000 cfs. This data reflects that the river stages typically decline gradually from seasonal high flows during the spring months.

During our informal consultation discussions with USFWS and FWCC in 2004 and 2005, we also developed a low flow operations protocol. This protocol ensures that releases from Jim Woodruff Dam to the Apalachicola River during low flow conditions provide for at least the average basin inflows to the system or greater. The low flow protocol recognizes that high flow conditions adequate to fully inundate spawning habitat cannot normally be sustained for the entire spawning period of March through May without drawing substantial storage from upstream reservoirs, and that it would be prudent to conserve some storage early in the year in order to provide augmentation flows during the later summer to fall months in support of protected mussel needs. USFWS agreed that impacts that may occur to protected species due to low flow conditions on the river would be considered an impact of the declining basin inflows rather than a discretionary action by the Mobile District, provided releases to the river equal or exceed the basin inflows. Discretionary actions by Mobile District to release flows greater than the basin inflows would represent a mitigative measure to reduce the impacts of declining basin inflows.

The above referenced data and information has been integrated into a proposed interim operations plan for our Jim Woodruff Dam operations. The interim operations plan details how we intend to operate in the spring of 2006 in consultation with the USFWS. At the beginning of the potential Gulf sturgeon spawning period in March this year, releases were maintained at around 22,000 cfs or above, based on the computed average basin inflows. We will continue to monitor basin inflows, the status of the upstream reservoirs, and predicted climatological conditions for the upcoming weeks to determine the amount of releases to be made to the Apalachicola River during the Gulf sturgeon spawning period. If low flow conditions are experienced during the fish spawn period, gradual declines in releases may be made; however, any reductions in releases would be consistent with the gradual decline in basin inflows and releases will approximate or exceed the average basin inflows. Augmentation of flows above basin inflows may also occur, if there are sufficient levels in the upstream reservoirs either to match or exceed the flows. As noted above, USFWS has agreed that conservation of some storage during this period may be appropriate in order to assure sufficient storage is available for future augmentation of flows during the summer to fall months in support of protected mussel species. Maintaining a constant flow rate throughout the spawning period could result in declining lake levels during the spring months as basin inflows decline. Accordingly, to avoid depleting storage that could be used to augment flows in the summer to fall months, USFWS has not recommended that 22,000 cfs or any other specific minimum flow be maintained for the entire spawning period. Instead, USFWS has agreed that a percentage of basin inflows may be stored when inflows are greater than 20,400 cfs. USFWS also recommends that releases approximate the basin inflow when inflows are less than 20,400 cfs, which would result in relatively stable lake levels during the spring months[1].

Elements of the interim operations plan are consistent with previous agreements reached during our informal consultations with USFWS and FWCC in 2003, 2004 and 2005 conducted during the annual fish management coordination meetings and during periodic consultations conducted during the fish spawn periods; and incorporating additional information from informal consultation discussions with USFWS earlier this year. The proposed interim operations plan also considers operations at Jim Woodruff Dam and releases to the Apalachicola River in support of the two federally-listed mussel species (the endangered Fat threeridge mussel and the threatened Purple bankclimber mussel); and describes our year-round operations, rather than just during fish spawning periods. The interim operations plan provides for balancing releases from Jim Woodruff Dam that equal or exceed the average basin inflows during specified low flow conditions (e.g., flows below 20,400 cfs during the Gulf sturgeon spawning period; and flows below 8000 cfs for other times of the year in order to support federally-listed mussels); and provides for augmentation of flows when inflows are less than 5000 cfs. The interim operations plan also provides for gradual ramping rates when releases are reduced, consistent with previous agreements reached with USFWS and FWCC on gradual ramping rates.

At the beginning of the potential Gulf sturgeon spawning period in March this year, releases were maintained at around 20,000 cfs or above. We will continue to monitor basin inflows, the status of the upstream reservoirs, and predicted climatological conditions for the upcoming weeks to determine the amount of releases to be made to the Apalachicola River during the Gulf sturgeon spawning period. If low flow conditions are experienced during the fish spawn period, gradual declines in releases may be made; however, any reductions in releases would be consistent with the gradual decline in basin inflows and releases will approximate or exceed the average basin inflows. Augmentation of flows above basin inflows may also occur, depending on the status of the upstream reservoirs.

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[1] The 22,000 cfs figure referenced in your letter is no longer relevant based on the most recent data collected in cooperation with USFWS over the past several years. Approximately 30,000 cfs would be required to fully inundate the rock ledge by depth of 4.6 ft (i.e., not 22,000 cfs). Spawning in 2005 was documented between flows of 20,400 cfs and 37,400 cfs, and these are the numbers now referenced in the interim operations table. The 22,000 cfs figure was apparently derived from old data (now known to be in error), that a flow of 21,600 cfs would inundate the rock ledge to a depth of 4.6 ft. In our discussions with USFWS to date, not only did USFWS not recommend a minimum flow of 22,000 cfs but USFWS also concurred that it would be desirable to store a portion of basin inflows in upstream reservoirs when flows are greater than 20,400 cfs.

For your information, Mobile District has initiated formal consultation with the USFWS, pursuant to Section 7 of the ESA. We are seeking USFWS's concurrence that our water management operations at Jim Woodruff Dam and the associated releases to the Apalachicola River, as described in our Section 7 consultation request and interim operations plan, are not likely to jeopardize the continued existence of Gulf Sturgeon or result in adverse modification or destruction of its critical habitat, or result in jeopardy to the federally listed mussel species (see enclosed Mobile District letter dated March 7, 2006, and response from USFWS dated March 9, 2006). In the interim, the District will continue our consultation discussions with USFWS and will conduct operations at Jim Woodruff Lock and Dam in a manner that minimizes or avoids impacts to the federally-protected species during Gulf sturgeon fish spawning and low flow conditions.

Sincerely,

Peter F. Taylor Jr.
Colonel, Corps of Engineers
District Commander

Enclosures

D-13 CESAM letter to FDEP-Castille dated 15 May 2006, invitation to 24-25 May Hydrological Modeling Technical Workshop

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

REPLY TO
ATTENTION OF

MAY 1 5 2006

Inland Environment Team
Planning and Environmental Division

Ms. Colleen Castille, Secretary
Florida Department of Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

Dear Ms. Castille:

On March 7, 2006, the U.S. Army Corps of Engineers (Corps) submitted a request to the U.S. Fish and Wildlife Service (USFWS) to initiate formal Section 7 consultation under the Endangered Species Act regarding our water management operations at Jim Woodruff Dam. While consultation discussions proceed, we have been operating under an Interim Operations Plan, which was included in the request to initiate formal consultation.

The Corps is continuing discussions with the USFWS concerning the formal Section 7 consultation process. As part of these discussions, we are addressing the impacts of the Interim Operations Plan. In order to assess these impacts, we plan to conduct hydrological modeling of the Interim Operations Plan, which will also address potential adjustments to the plan if determined necessary. Both agencies want to assure we are using the most appropriate modeling tools and best scientific information available to assist in completing a biological opinion, and that it would be helpful to confer with others with technical modeling expertise. The Corps and USFWS have therefore scheduled a modeling workshop to be held on May 24-25, 2006, at the Lake Seminole Resource Management Office near Chattahoochee, Florida. The purpose of the workshop will be to assure that there is a common understanding of the elements of the Interim Operations Plan, what it is intended to achieve, and what can be expected to be observed in real time operations when implementing the Interim Operations Plan. The technical group would then assure that the appropriate modeling assumptions, tools, and procedures are selected and implemented to portray the impacts of the Interim Operations Plan or any alternative operations procedures as accurately or closely as possible.

By this letter, we are extending an invitation to the State of Florida to provide technical representation at the workshop scheduled for May 24-25. The workshop will be scheduled to begin at 10:00 a.m. central daylight time (11:00 a.m. eastern daylight time) on Wednesday, May 24; and should conclude by noon on Thursday, May 25. We are inviting technical representatives from the states of Alabama, Florida, and Georgia to attend this workshop. We only request that attendance at the workshop be limited to technical representatives and that no attorneys be present. Please notify Ms. Joanne Brandt, Corps Inland Environment Team, of your acceptance of this invitation and provide her with the names of the representatives who plan to attend so we will know who to expect at the workshop. She can be reached by telephone at (251) 690-3260 or by email at: joanne.u.brandt@sam.usace.army.mil.

Sincerely,

Peter F. Taylor
Colonel, Corps of Engineers
District Commander

D-14 FDEP-Castille letter to CESAM dated 5 June 2006

Department of Environmental Protection

Jeb Bush
Governor

Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Colleen M. Castille
Secretary

June 5, 2006

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

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: Apalachicola-Chattahoochee-Flint River Endangered Species Act Consultation

Dear Ms. Carmody and Mr. Flakes:

You have provided an opportunity for comments on the Corps of Engineers' ("Corps") proposed Interim Operations Plan ("IOP") for the Apalachicola-Chattahoochee-Flint River system, as reflected in the Corps' March 7, 2006, letter initiating consultation on the IOP pursuant to the Endangered Species Act, 16 U.S.C. §§ 1531 *et seq.*, (the "Consultation Letter"). Florida understands that this opportunity is limited to comments concerning hydrologic and modeling issues presented by the IOP, and does not extend to the biological impacts of the IOP. The Florida Department of Environmental Protection and the Florida Fish and Wildlife Conservation Commission may provide further comment on the latter topic in the future.

Your agencies held a briefing on May 24-25, 2006, to inform Florida and other interested parties about the status of your efforts to model elements of the IOP. While Florida appreciated the opportunity to meet, we learned of this meeting only one week prior to its occurrence. Florida was offered an opportunity to submit comments by June 5, 2006, concerning the accuracy of the modeling information and the impact of the IOP on Basin hydrology. Florida requested a two-week extension of this short "comment period" because of the difficulty of comprehensively responding, but that request was denied. Consequently, Florida has not completed its review of the modeling information presented at the May 24-25 meeting and is not able to provide meaningful input on the model's assumptions and outputs at this time. Such information will, however, be provided when it is available. *Cf. Interagency Cooperation –*

Endangered Species Act of 1973, as Amended, Final Rule, 51 Fed. Reg. 19,926, 19,950 ("We [FWS] believe that information could become available at any time during the consultation, and such information should be submitted to the Service for its consideration."). While it is critical that the IOP be accurately modeled and understood, Florida is far more concerned about the potential fundamental shortcomings of the IOP, rather than the intricacies of the model selected to analyze it. Consequently, please consider the following comments regarding the Department's perceived shortcomings in the IOP.[1]

The IOP's technical parameters are detailed in the Consultation Letter and will not be repeated here. In sum, the IOP is designed to allow the Corps, during low flow periods, to release water from Jim Woodruff Lock and Dam in a manner that loosely approximates Basin Inflow above that facility (calculated *after* all upstream depletions have occurred). Water stored in the upstream reservoirs will be utilized under the IOP to support flows of 5,000 cubic feet per second ("cfs") in the Apalachicola River only in the most extreme drought scenario to "benefit" threatened and endangered mussel species. The IOP does not accurately characterize the nature of the Corps' discretionary action subject to review under the ESA.

Section 7 of the Endangered Species Act ("ESA"), 16 U.S.C. § 1536(a)(2), requires the Corps to avoid jeopardizing listed species and to avoid destroying or adversely modifying designated critical habitat in the Apalachicola River. The Corps knows what releases are required to comply with the ESA. *See* Consultation Letter at 9, 12 and Enclosure 29, 32. Nevertheless, under the IOP, the Corps refuses to commit to utilizing upstream storage to support Apalachicola River flows whenever Basin Inflow declines below 20,400 cfs - *irrespective of the amount of water available in storage.*

There is no question that the Corps controls the amount of water that is retained in the upstream reservoirs, and that the ESA, therefore, applies to the Corps' decisions regarding how much water remains in storage and how much is released for downstream needs. *See In re Operation of the Missouri River System Litigation*, 421 F.3d 618, 631 (8th Cir. 2005) ("Because the Corps is able to exercise its discretion in determining how best to fulfill the purposes of the reservoir system's enabling statute [the Flood Control Act], the operation of the reservoir system is subject to the requirements of the ESA."). *See also id.* at 626 ("The [Corps'] operation of the reservoir system also brings the Corps within the provisions of the [ESA]."). Indeed, but for that recognition, the Corps would not have initiated consultation with the Fish and Wildlife Service ("Service") in the first place. The Corps, nevertheless, contends that its decision not to release stored water when Basin Inflow declines below 20,400 cfs – and its converse decision to retain water in storage during such periods – somehow do not constitute actions subject to the ESA.

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[1] These comments do not waive, and should not be construed as waiving, any claims by Florida in any litigation involving the parties.

See Consultation Letter at 10, 13 and Enclosure 25. Florida urges the Service not to capitulate to this faulty description of the Corps' proposed actions.

The IOP defines the proposed action for consultation purposes as if significant reservoir storage did not exist, or as if the Corps lacked the discretion to release stored water. Both are factually and legally inaccurate. The Corps may not insulate water stored in Lake Lanier and the other upstream reservoirs from the consultation process, when the Corps controls the manner in which that water is retained and released. *See Klamath Water Users Protective Ass'n v. Patterson*, 204 F.3d 1206, 1213 (9th Cir. 2000) (as amended) ("Because Reclamation retains authority to manage the Dam, and because it remains the owner in fee simple of the Dam, it has responsibilities under the ESA as a federal agency. *These responsibilities include taking control of the Dam when necessary to meet the requirements of the ESA*, requirements that override the water rights of the irrigators.") (Emphasis supplied). The Corps' decision under the IOP to retain water in upstream reservoirs instead of releasing it when needed to support quantified species and habitat needs is, itself, a decision subject to the ESA's requirements. Therefore, the Service is obligated by Section 7 of the ESA to analyze the impact of that decision on listed species and, if necessary, to avoid a violation of the ESA's substantive prohibitions, to include as a reasonable and prudent alternative a demand for additional water releases. 16 U.S.C. §1536(a)(2); 50 C.F.R. §402.14(g) and (h); *cf.* 51 Fed. Reg. at 19,952 ("[T]he Service cannot abdicate its ultimate duty to formulate these [reasonable and prudent] alternatives by giving Federal agencies control over the content of a biological opinion.").

It is clear that additional releases of stored water *are* required to support protected species and habitats in the Apalachicola River. Nowhere is that fact more apparent than with respect to the Apalachicola River mussel species. The Florida Department of Environmental Protection commissioned the enclosed report entitled FRESHWATER MUSSEL AND HABITAT SURVEYS OF THE APALACHICOLA RIVER, CHIPOLA RIVER AND SELECTED SLOUGHS / TRIBUTARIES (May 5, 2006). The report demonstrates, consistent with the Corps' data, that flows of at least 8,000 cfs are required to support extant mussel populations. Moreover, contrary to the Corps' assessment, these animals are not mobile enough to escape the fatal impacts of rapid flow reductions. *Id.* at 34-35. Other protected species require even higher flows during other parts of the year.

In conclusion, Florida looks forward to working with you to better understand the Corps' IOP and its impacts on Basin hydrology. However, if the ongoing consultation process is to be a success, the Corps must reassess the extent to which reservoir storage is available to meet species needs in the Apalachicola River.

Sincerely,

Colleen

Colleen M. Castille
Secretary

Cc: Dale Hall
J. P. Woodley
Sam Hamilton
Peter Taylor

D-15 CESAM letter to FDEP-Castille dated 28 June 2006, notice of 45-day extension of consultation period, and invitation to follow-on Hydrological Modeling Workshop

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

June 28, 2006

REPLY TO
ATTENTION OF:

Inland Environment Team
Planning and Environmental Division

Ms. Colleen Castille
Secretary
Florida Department of Environmental Protection
Marjory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399-3000

Dear Ms. Castille:

I have received your letter dated June 5, 2006, regarding your comments related to feedback on the workshop on May 24-25, 2006, held jointly by the U.S. Army Corps of Engineers (Corps) and the U.S. Fish and Wildlife Service (USFWS). This workshop was held in association with ongoing formal consultation between the Corps and USFWS, pursuant to Section 7 of the Endangered Species Act of 1973, regarding the impacts of water management operations and the resultant releases from the Jim Woodruff Dam on federally listed species and critical habitat on the Apalachicola River (the threatened Gulf sturgeon and its critical habitat, the endangered fat threeridge mussel, and the threatened purple bankclimber mussel). The purpose of this workshop was to address technical comments on the appropriate modeling approach and assumptions to be used in hydrological modeling to be conducted by the Corps and USFWS to assess the potential impacts of the Interim Operations Plan (IOP) submitted by the Corps in the request to initiate formal consultation. Technical representatives from each of the States of Alabama, Florida and Georgia were invited to participate in the workshop, and we appreciate your participation.

At the workshop, we invited comments and suggestions to assure that modeling conducted by the Corps, USFWS and others would accurately reflect the IOP and Corps operations. We asked that discussion not focus on elements of the IOP but how the IOP should be modeled. During the workshop, USFWS also described the regulatory requirements and schedule for completion of formal consultation. Comments on the environmental flow needs of the protected species and impacts of the Corps operations were solicited separately by USFWS from State fish and wildlife agencies, and other public, private or commercial sources as part of the formal consultation process. By law, the Final Biological Opinion must be completed within a 135-day period or July 21, 2006, unless the Corps and USFWS mutually agree to an extension. This timeframe is comprised of 90 days of formal consultation, during which information is gathered and consultation discussions occur; and an additional 45 days for USFWS to complete the Biological Opinion. By letter dated June 13, 2006, the USFWS requested a 45-day extension of the consultation period. We have reviewed their request and agree that it is appropriate to extend the consultation period for an additional 45 days to September 5, 2006. We have notified the Service of our agreement to the extension and will also inform the Court of this development.

While operating under the IOP this spring we have identified several "lessons learned" and have asked the USFWS to evaluate proposed adjustments to the IOP that could minimize unintended impacts on project operations and improve our ability to manage releases from Jim Woodruff Dam to meet the needs of the federally listed species as well as our authorized purposes. These proposed adjustments include the method for computing basin inflows to manage releases under the IOP (using a seven-day average basin inflow rather than a three-day average); tying computations of basin inflows and releases to the Chattahoochee gage; clarifying threshold flows for ramping rates associated with flood control operations; clarifying how releases for gradual ramping rates are captured in the volumetric computation of releases to meet the volumetric computation of basin inflows; and a lowering of the upper flow threshold for the months of June through February which would allow for additional storage under certain conditions. In addition to inquiring about changes we have made to the IOP, you also suggested several specific changes be made to the IOP. Under separate cover, we have provided all three States the IOP, the Revised IOP, and all of the modeling data. We are scheduling another workshop to explain the IOP and how we modeled it. A notice will be coming to you in the near future with the time, date, and location. We will take your current comments and any future comments into consideration in deciding upon any other revisions.

The remainder of your comments relate to anticipated impacts and suggested changes to the IOP. I have been advised that any proposed changes to the IOP or consultation schedule should be handled through the ongoing mediation discussions between the Corps and the States of Alabama, Florida and Georgia. Therefore, the Corps mediation representative, Ms. Karen Durham-Aguilera, will provide any formal response to your concerns, if necessary, pending the results of her discussions with the parties involved with the mediation.

Thank you for your assistance.

Sincerely,

Curtis M. Flakes
Chief, Planning and Environmental
Division

Copies Furnished:

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

Mr. Onis "Trey" Glenn, III
Director
Alabama Department of Environmental Management
Post Office Box 301463
Montgomery, Alabama 36130-1463

Dr. Carol Couch
Director
Georgia Environmental Protection Division
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

D-16 Georgia Environmental Protection Division (GA-EPD) letter to CESAM and USFWS dated 24 March 2006

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

~~DH~~ R
DEM
~~CofPD-EI~~
PD-EI
For response
Joanne

March 24, 2006

Col. Peter F. Taylor, Jr.
Department of the Army
Mobile District, Corps of Engineers
Attention: CESAM-DE
Post Office Box 2288
Mobile, Alabama, 36628-0001

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

Dear Col. Taylor and Ms. Carmody:

The State of Georgia understands that the U.S. Army Corps of Engineers has initiated formal consultation with the U.S. Fish and Wildlife Service under the Endangered Species Act concerning the Corps' interim water management operations at Jim Woodruff Dam and the associated releases to the Apalachicola River. We appreciate the Corps' responsibility under the Act to take necessary and appropriate actions to insure that its actions are not likely to threaten the continued existence of protected species within the Apalachicola-Chattahoochee-Flint (ACF) Basin.

As you know, the Service's regulations governing formal consultation provide that such consultation is to be based upon "the best scientific and commercial data available or which can be obtained during the consultation for an adequate review of the effects than an action may have upon listed species or critical habitat." 50 C.F.R. § 402.14(d). In this instance, ensuring that the outcome of the formal consultation, the Biological Assessment, is based upon sound logic and the best scientific and commercial data is essential not only to the protection of the species but to the safe and proper management of the water resources of the ACF Basin. To that end, the State of Georgia desires to provide to the Corps and the Service all of the input and support that it can. Federal agency cooperation with the states is a central tenet of the Act. "It is further declared to be the policy of Congress that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species." ESA § 2(c)(2), 16 U.S.C. § 1531(c)(2). The Service's Consultation Handbook instructs the Service to "request an information update from State agencies prior to preparing the final biological opinion to ensure that the findings and recommendations are based on the best scientific and commercial data available." Consultation Handbook at p. 2-16. Georgia's input to the consultation process

is particularly appropriate and necessary in this instance for two reasons. First, the two freshwater mussel species at issue in the consultation inhabit the Georgia portion of the ACF Basin as well as the Florida portion, and the State of Georgia has its own responsibility for the protection and management of these species. Second, the Corps of Engineers' plan for interim operations has the potential to significantly affect the water resources of the ACF Basin upon which other critical wildlife, environmental, and human needs within Georgia depend.
I request that the Service and the Corps keep my office updated on the progress of the formal consultation. In addition, I request that you allow us to provide information relevant to the analysis of the effects of various reservoir operations on the protected species at issue and the water resources of the Basin. Finally, I request the opportunity to review and comment on a draft of the Biological Opinion before it is finalized.

Please contact me at your earliest convenience to further discuss these matters. Thank you in advance for your assistance.

Sincerely,

Carol A. Couch, Ph.D.
Director

CAC:ypf

D-17 GA-EPD letter to CESAM dated 5 May 2006, with modeling memorandum

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 5, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

Re: Corps ACF Operations

Dear Colonel Taylor:

I am writing to alert you to what the State of Georgia fears could be devastating consequences of the Corps of Engineers' current ACF Basin reservoir operations. Our computer modeling shows that, if the Corps continues on its present course, before the end of this year, the Corps could draw down the federal reservoirs in the ACF Basin to their lowest levels in 50 years and, even worse, could effectively empty them. My staff has tried repeatedly to no avail to exchange information and discuss this with Corps personnel over the past couple of weeks. I request that you review this situation immediately and assure us that the Corps is taking appropriate action to protect the water stored in the ACF Basin reservoirs from significant and unnecessary depletion.

As you know, by letter dated March 7, 2006 to the U.S. Fish and Wildlife Service, the Corps requested initiation of formal consultation regarding the Corps' operations at Jim Woodruff Dam pursuant to Section 7 of the Endangered Species Act. In that letter, the Corps confirmed that, pending completion of the formal consultation, the Corps would operate in accordance with an Interim Operations protocol set forth in the letter and an attached table in an effort to minimize to the extent practicable and feasible adverse effects of the Corps' operation of Jim Woodruff Dam on the listed species within the Basin. That protocol specified the following operational rules:

> During the months of March through May: (a) when Basin Inflows are greater than or equal to 37,400 cubic feet per second (cfs), the Corps would release no less than 37,400 cfs from Woodruff; (b) when Basin Inflows are between 20,400 cfs and 37,400 cfs, the Corps would release between 70% and 90% of Basin Inflows, but not less than 20,400 cfs; and (c) when Basin Inflows are less than 20,400 cfs, the Corps would release 100% of Basin inflows, but not less than 5,000 cfs.

From June through February: (a) when Basin Inflows are greater than or equal to 37,400 cfs, the Corps would release no less than 37,400 cfs from Woodruff; (b) when Basin Inflows are between 8,000 cfs and 37,400 cfs, the Corps would release between 70% and 90% of Basin Inflows, but not less than 8,000 cfs; and (c) when Basin Inflows are less than 8,000 cfs, the Corps would release 100% of Basin inflows, but not less than 5,000 cfs.

The protocol also set forth certain rules limiting the rates at which the Corps would ramp-down releases (between .25 and 1 foot per day, depending on the current release range) as Basin Inflows fall.

The State of Georgia has been monitoring Basin Inflows since the Corps announced the Interim Operations protocol. According to our data, Basin Inflows have dropped rapidly as the spring has progressed. Over the past several weeks, Basin Inflows have resembled, and in some instances have been lower than, inflows experienced during the severe drought of 2000. The attached memorandum by Dr. Wei Zeng of Georgia EPD, including particularly Figure 1 to the memorandum, compares Basin Inflows during the spring in 2006 and 2000. We are concerned that if climatic conditions do not change significantly, we could continue to see inflow rates through the rest of the year that resemble year 2000 conditions.

We also have been monitoring carefully the Corps' releases from Jim Woodruff Dam this spring and analyzing the potential effect on the federal reservoirs if the Corps continues to operate in its current manner. The Corps' recent operations have resulted in the release of significantly greater than 100% of Basin Inflows. We are unable to determine whether this is wholly the result of the limitations on ramp-down under the Interim Operations protocol or instead is due in part to operational imprecision or error. What we do know is that the over-release of Basin Inflows is significant. From March 15 to the end of April, the Corps released 68,999 cfs-days (136,618 acre-feet) more than Basin Inflows. This amount is equivalent to 56% of Walter F. George's conservation storage, 42% of West Point's, or 12% of Lanier's.

Dr. Zeng's memorandum discusses the potential consequences of the Corps' continued operation of the federal reservoirs under the Interim Operations protocol, assuming that Basin Inflows continue to resemble those of 2000. Dr. Zeng analyzes three scenarios, each of which produces the alarming results, as shown in figures 2 through 4 of the memorandum. Assuming that the Corps were to operate strictly in accordance with the Interim Operations protocol for the rest of the year and did not limit ramp down or otherwise over-release Basin Inflows, Lake Lanier would drop to a level of 1050 feet above mean sea level by the first of November 2006. Lake Lanier has not fallen to this low a level since its early years in the 1950's. Such draw down would place Georgia's water supply, and water quality and biological resources throughout the ACF Basin, in jeopardy, particularly if drought conditions were to continue beyond the end of this year. Over-releases and limitations on ramp-down would exacerbate the draw down, as would the imposition of a minimum flow requirement of greater than 5,000 cfs at the Chattahoochee Gage during the summer months. Any one or a combination of those factors could drain completely the conservation pools of Lake Lanier, West Point, and Walter F. George, the results of which would be nothing less than catastrophic.

I request that you review the situation immediately. Please confirm whether the Corps is releasing any water in excess of that mandated under the Interim Operations protocol.

Furthermore, I request that the Corps perform and share with the State of Georgia as soon as possible its own analysis of the effect of the Corps' continued adherence to the Interim Operations protocol in the event that the current drought conditions continue through this year and beyond. Finally, I request that the Corps proceed with extreme caution and, if necessary, consult with the Fish and Wildlife Service on modification of the Interim Operations protocol so as to avoid substantial depletion of ACF Basin storage.

A prompt response to these concerns would be appreciated by Wednesday, May 10. In follow up, please contact Jim Ussery, EPD Assistant Director, 404/656-4713.

Sincerely,

Carol A. Couch
Director

CAC:ypf

ATTACHMENT

cc: Brigadier General Michael J. Walsh, South Atlantic Division
U.S. Army Corps of Engineers
Governor Sonny Perdue

Memorandum

To: Carol Couch

From: Wei Zeng

Date: May 5, 2006

Re: Projected ACF scenarios under the Corps' Interim Operation Table and Year 2000 – 2001 hydrologic conditions

The following analyses were based on combinations of the assumptions that (1) the Corps operates the ACF projects closely according to its Interim Operation Table, or with a 10% over-release, (2) the hydrologic conditions that we experienced in the period 2000 through 2001 are repeated from this point on, and (3) there is an 8,000-cfs minimum flow requirement imposed to protect endangered mussel species downstream of Jim Woodruff Dam. The assumptions of model simulations are shown in Table 1.

Table 1. Model Assumptions

Model Identifier	Corps compliance with its own Interim Operations	8,000-cfs non-spawning season minimum flow requirement
F0503V2	1. Closely following the Interim Operations 2. Releasing 90% of BI when BI is between 20,400-cfs and 37,400-cfs in spawning season, and 3. Releasing 90% of BI when BI is between 8,000-cfs and 37,400-cfs in non-spawning season	None.
F0503V3	Same as above	Imposed
F0503V4	Similar to F0503V2, but with 10% over-release at Jim Woodruff (close to what we've seen from Mar. 15 to Apr. 30, 2006)	None

All the other conditions remain the same as in our earlier models simulating the Florida ESA demands. These common conditions include year 2000 M&I demands, dry year agricultural irrigation, all federal projects in support of flow requirement downstream of Jim Woodruff, 750-cfs minimum flow requirement at Atlanta, 1,160-cfs minimum flow requirement at Columbus, and other conditions reflected in the ACF Existing Condition model.

Fig. 1 depicts the hydrologic similarity between the first four months of 2006 to the same period in the year 2000. As a matter of fact, from mid-March through the end of April, ACF Basin Inflow in 2006 has been equivalent to or worse than that in the same period in 2000. It will not be unreasonable to assume that something similar to 2000 – 2001 hydrologic conditions may take place from this point on.

The recorded elevations of the ACF federal projects on April 30, 2006 were set to be the starting elevations in the models. Hydrologic conditions from May 1, 2000 through December 31, 2001 were fed into the model as assumed hydrologic conditions for May 1, 2006 through December 31, 2007.

The simulation results are shown in Figs. 2 through 4. The blue curves show recorded project elevations. The other curves show projected elevation changes under different scenarios. These results indicate that even if the Corps operates the ACF projects exactly according to the Interim Operation Table from this point on, a repetition of the 2000 – 2001 hydrologic conditions will result in severe impacts to the reservoirs. Furthermore, if the Corps deviates from its Interim Operation Table, and over-releases by 10%, the impacts would be exacerbated in the form of more significant drawdown and prolonged periods of low elevations. If an 8,000-cfs post-spawning minimum flow requirement is imposed upon the system, the reservoir storage may be completely depleted.

Fig. 5 shows observed flow at Chattahoochee, Florida, as compared to ACF Basin Inflow (derived from the Corps' sheet provided to us earlier) and flow requirements prescribed by the Corps' Interim Operation Table. Summations of the observed flow and of the BI indicate that, from March 15 to the end of April, the Corps has released 68,999 cfs-days (136,618 acre-feet) more than BI. This amount is equivalent to 56% of Walter F. George's conservation storage (42% of that of West Point, and 12% of that of Lanier).

Three additional simulations have been made to show potential scenarios under the Corps' Interim Operation Table. These simulations are similar to the ones summarized in the earlier part of this memorandum, except that in these ones, I assumed the Corps would pass only 70% of ACF Basin Inflow (when Basin Inflow is in the intermediate range, i.e. between 20,400-cfs and 37,400-cfs for March through May, and between 8,000-cfs and 37,400-cfs for June through February) downstream of Jim Woodruff Dam, the most conservative approach in the framework of the Interim Operation Table.

The assumptions of these additional model simulations are shown in Table 2.

All the other conditions remain the same as in earlier analyses.

The simulation results are shown in Figs. 6 through 8. The blue curves show recorded project elevations. The other curves show projected elevation changes under different scenarios.

Table 2. Assumptions of Additional Model Simulations

Model Identifier	Corps compliance with its own Interim Operations	8,000-cfs non-spawning season minimum flow requirement
F050506	4. Closely following the Interim Operations 5. Releasing 70% of BI when BI is between 20,400-cfs and 37,400-cfs in spawning season, and 6. Releasing 70% of BI when BI is between 8,000-cfs and 37,400-cfs in non-spawning season	None
F0505V2	Similar to F050506, except there is a 10% over-release at Jim Woodruff Dam.	None
F0505V3	Same as F050506	Imposed

If the 2000 – 2001 hydrologic conditions were to be repeated for the rest of this year and next year, under the most conservative approach prescribed by Corps' Interim Operation Table, The following things may happen.

(1) Lanier elevation (Fig. 6) may approach the historic low of 1052 feet at the turn of the year, and set new record low the next year, though the elevations were slightly higher than shown in Fig. 2. West Point and Walter F. George elevations (Figs. 7 and 8) may be higher than shown in Figs. 3 and 4, where 90% of Basin Inflow is released to downstream of Jim Woodruff Dam.

(2) A 10% over-release at Jim Woodruff Dam would set record low at Lanier in the fall this year, and again next year. It will also cause an additional drawdown of 2 to 4 feet at West Point and of 1 to 2 feet at Walter F. George.

(3) An 8,000-cfs non-spawning season minimum flow requirement downstream of Jim Woodruff Dam is not sustainable. It will drain all the projects in the ACF system, and cause them to be empty for prolonged period.

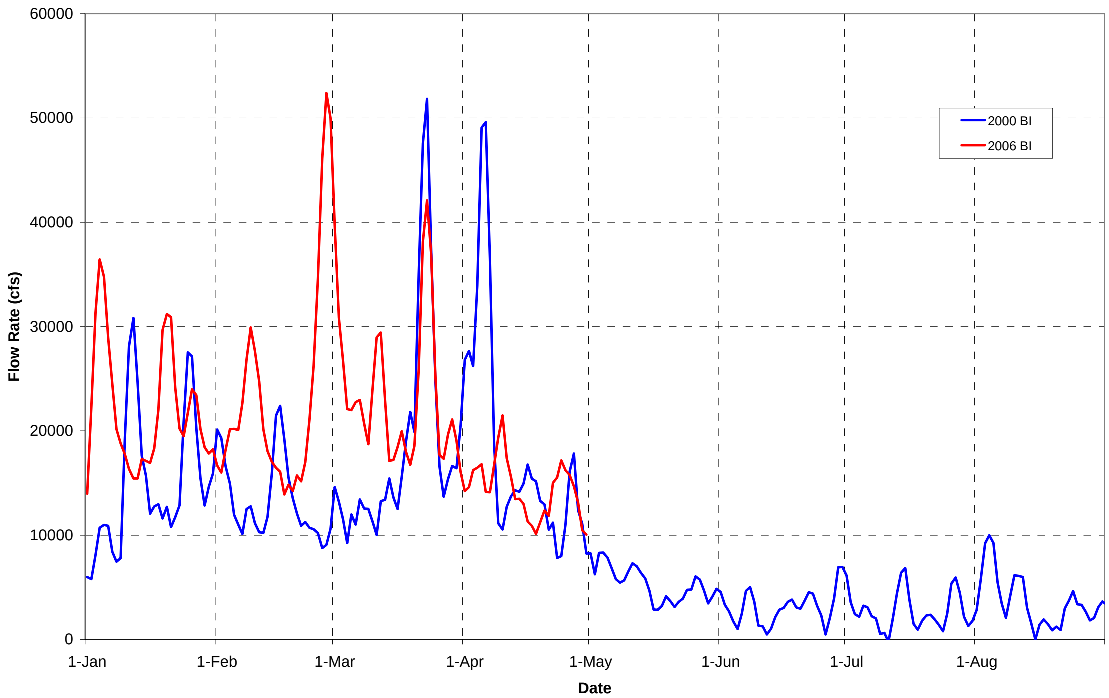


Fig. 1 Comparison of ACF Basin Inflows (down to Jim Woodruff) in 2006 and 2000

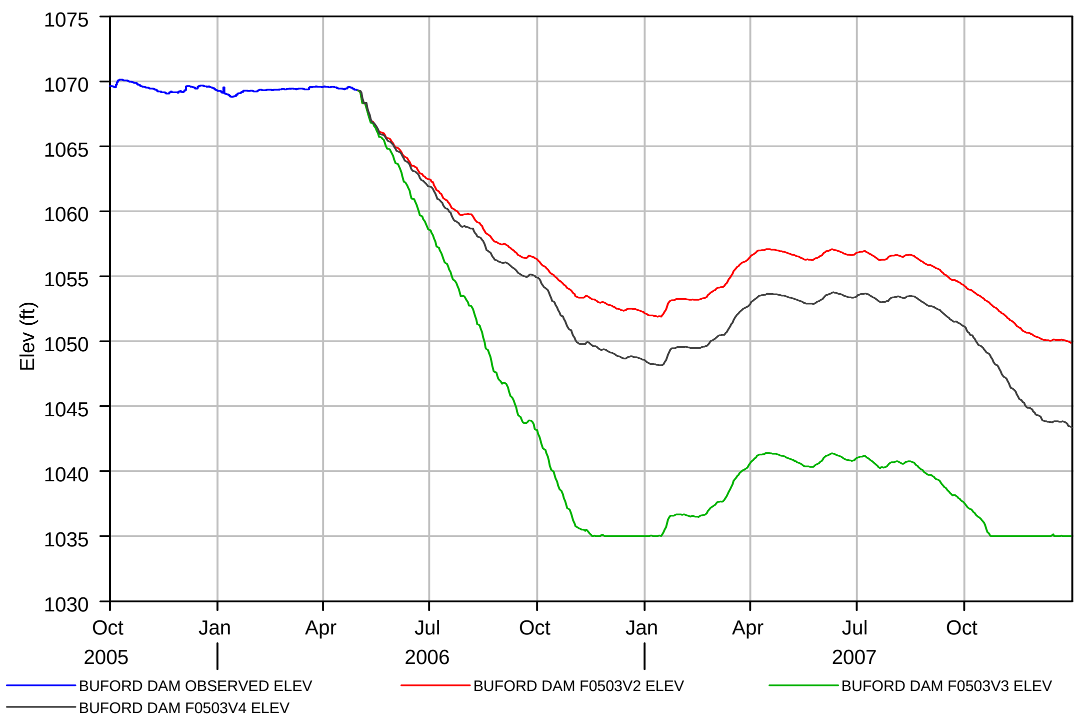


Fig. 2 Projected Lanier elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (90% BI release)

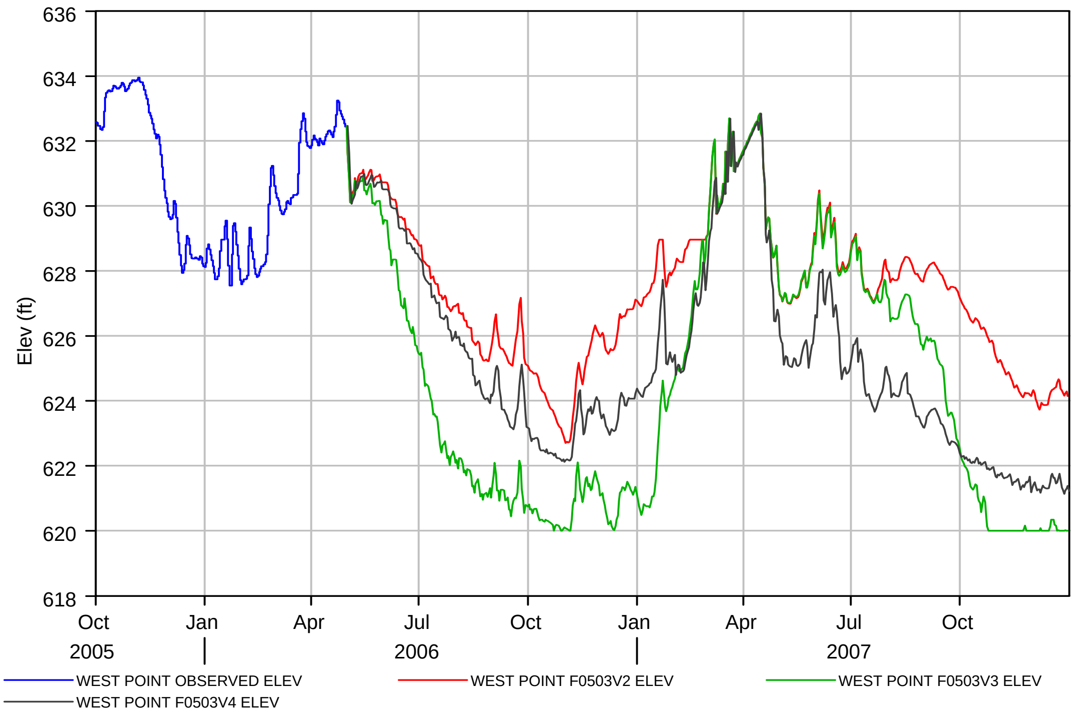


Fig. 3 Projected West Point elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (90% BI release)

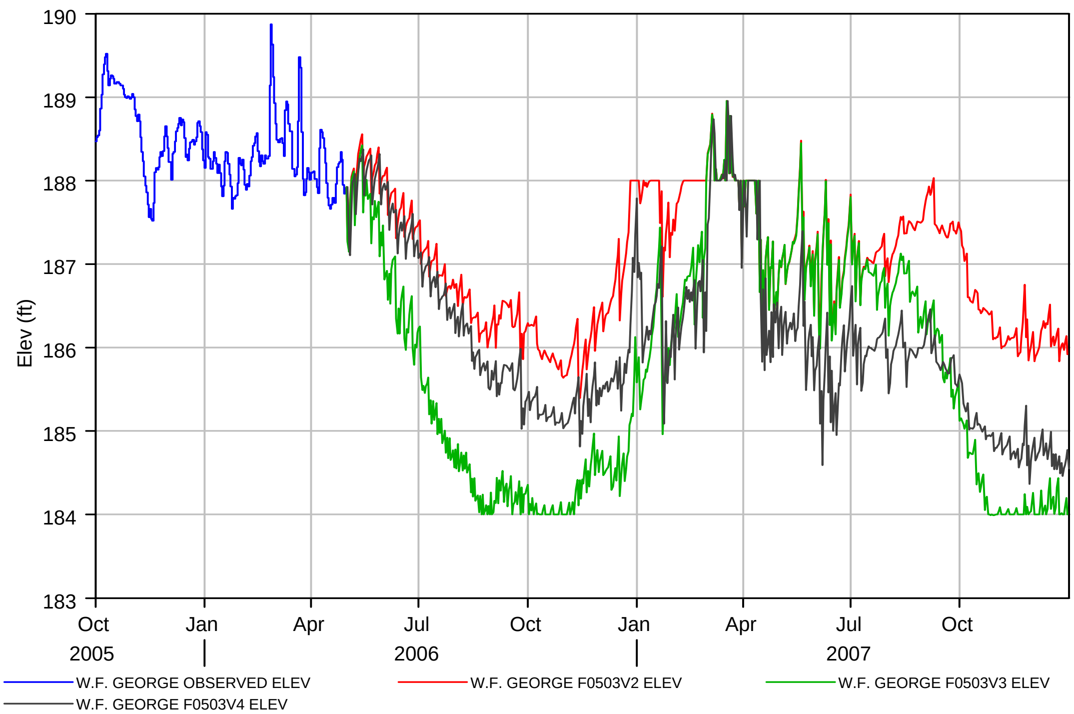


Fig. 4 Projected Walter F. George elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (90% BI release)

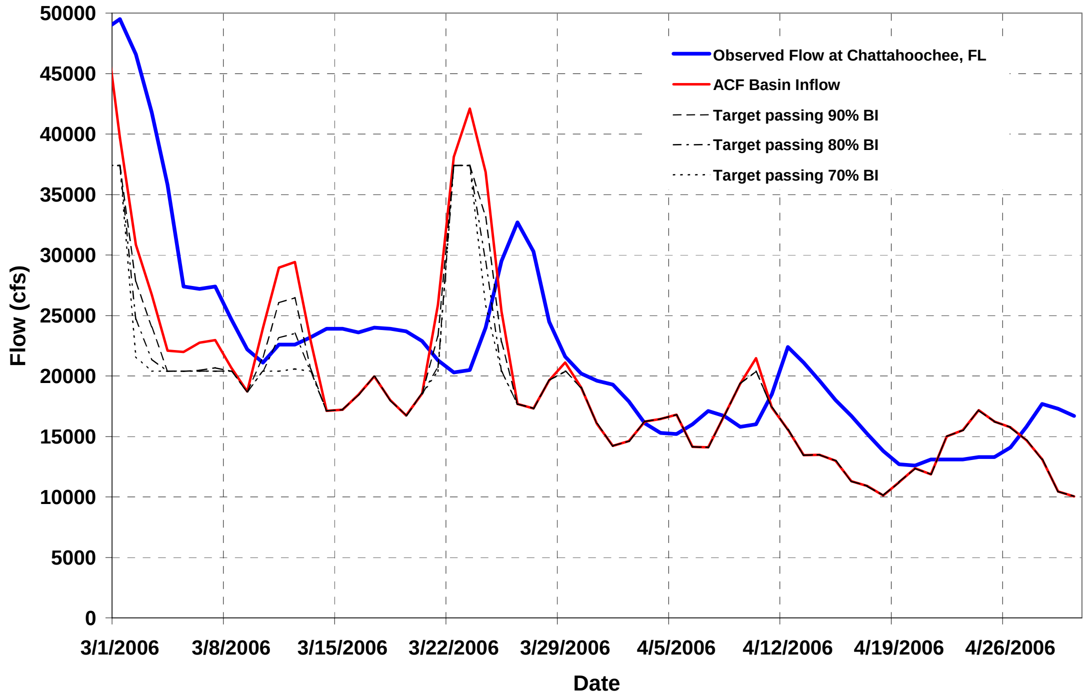


Fig. 5 ACF Basin Inflow and COE actual operation of Jim Woodruff Dam

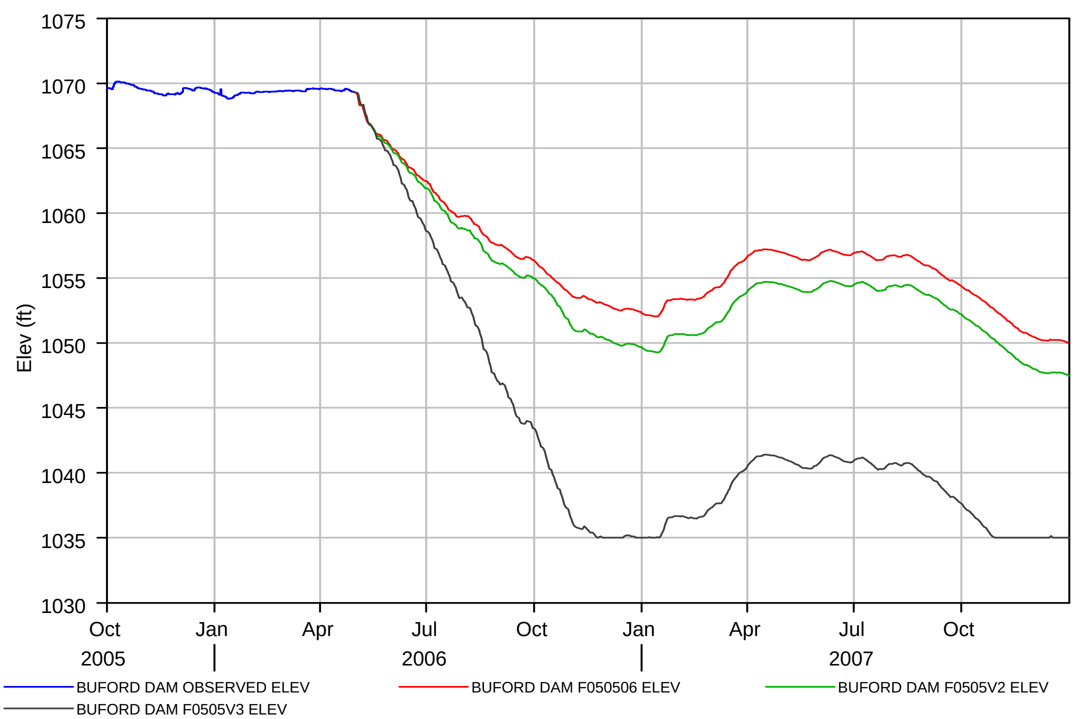


Fig. 6 Projected Lanier elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (70% BI release)

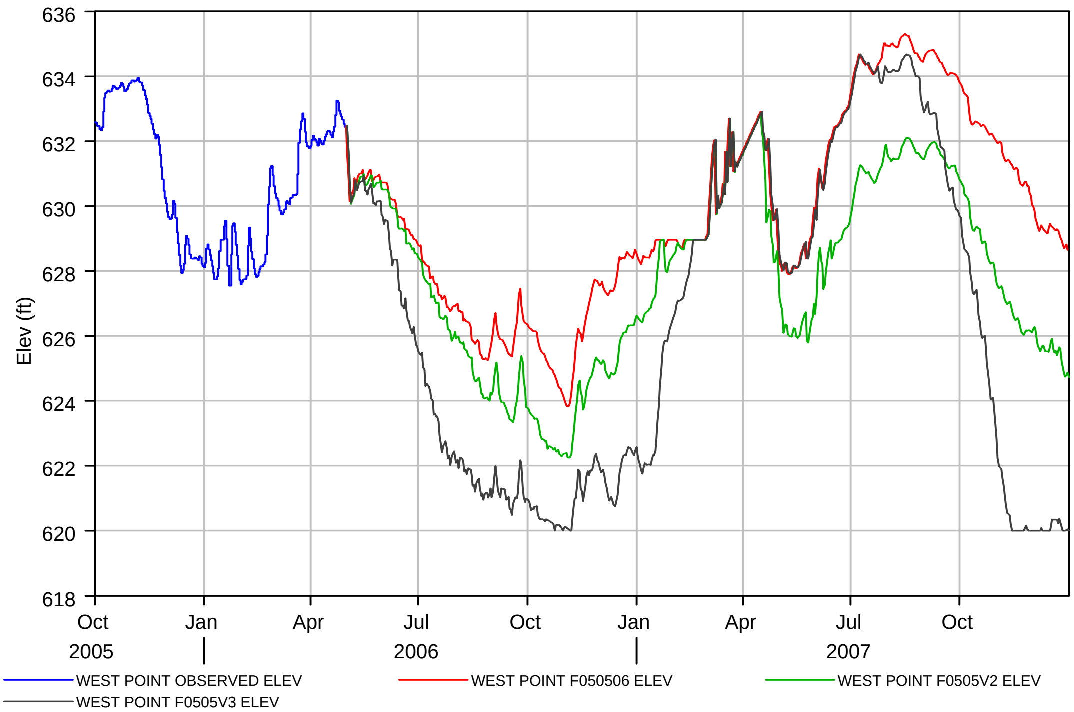


Fig. 7 Projected West Point elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (70% BI release)

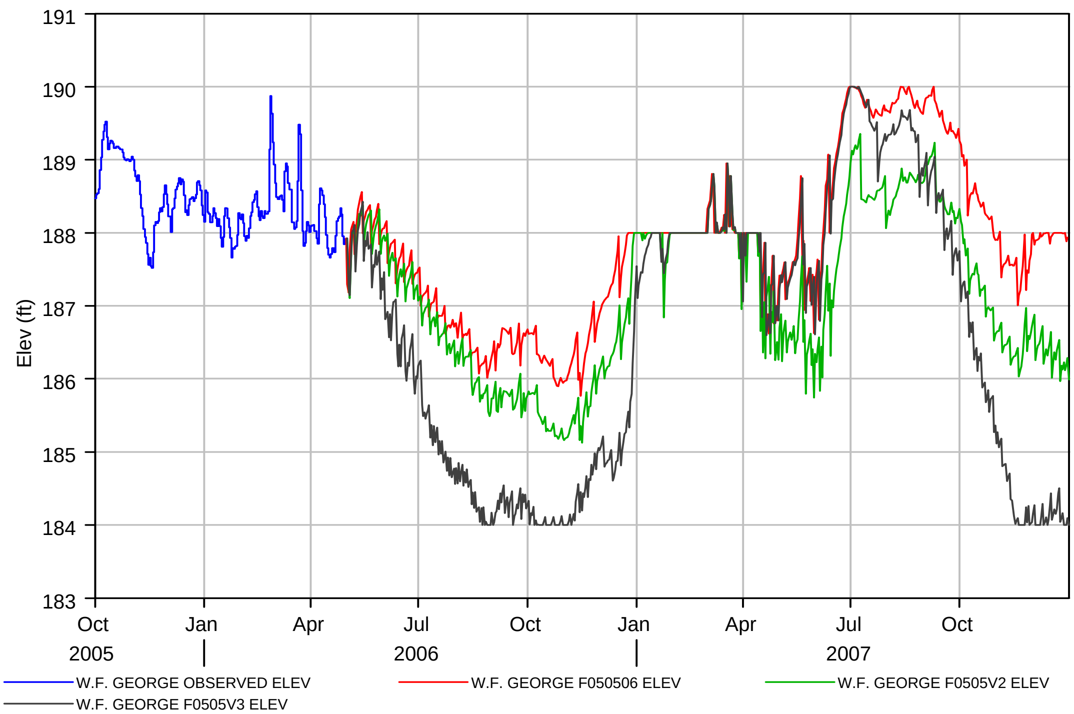


Fig. 8 Projected Walter F. George elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (70% BI release)

D-18 CESAM letter to GA-EPD dated 15 May 2006, response to 24 March and 5 May letters and invitation to 24-25 May 2006 Hydrological Modeling Technical Workshop

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

MAY 15 2006

Inland Environment Team
Planning and Environmental Division

Carol A. Couch, Ph.D, Director
Environmental Protection Division
Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch:

I received your letter dated March 24, 2006, addressed to Ms. Gail Carmody of the U.S. Fish and Wildlife Service (USFWS) and myself in which you offered assistance in providing technical input and support to assess the potential for impacts of the U.S. Army Corps of Engineers (Corps) water management operations at Jim Woodruff Dam to federally-protected species, and to ensure that the biological opinion prepared pursuant to consultation under Section 7 of the Endangered Species Act is based on the best scientific and commercial data available. I have also received your letter dated May 5, 2006, which provided the results of certain hydrological modeling conducted by the State of Georgia and expressed concern that the Corps may be releasing water in excess of that required by the Interim Operations Plan submitted in our request to initiate formal Section 7 consultation under the Endangered Species Act. Copies of your correspondence are enclosed for reference.

Your letter dated May 5, 2006, noted that the State of Georgia has been closely monitoring basin inflows in the Apalachicola, Chattahoochee, Flint (ACF) river basin and releases made from the Jim Woodruff Dam. You noted that the current conditions in the basin, specifically the declining basin inflows this spring that have dropped to levels approaching those during the drought year of 2000, and concern that the low flow conditions could potentially continue through the rest of the year. Concerns were also expressed that releases from Jim Woodruff were in excess of the 100 percent of basin inflows required under the Interim Operations Plan, and that the continued release of flows in excess of basin inflows could result in a dramatic drawdown of the federal reservoirs if dry conditions similar to the year 2000 continue.

We have also been closely monitoring basin inflows and adjusting our operations in accordance with the Interim Operations Plan. We agree that releases have at times exceeded 100 percent of basin inflow and this is primarily due to the ramp-down rates that are specified in the plan. Other factors include releases made that were in excess of the basin inflow when water was not being retained for storage in early March and our conscious efforts to minimize or avoid impacts to the Gulf sturgeon spawning activities below the Jim Woodruff Dam due to our continued consultation with the USFWS. We continue to refine our operations within the constraints of the Interim Operations Plan to make every effort to match releases to the basin inflows as called for in the plan, with due caution in order to protect the federally-protected species, and with the awareness of other project purposes and demands on the ACF system. It is also significant to note that real world operations will not be as precise as conditions observed in a model simulation.

We have reviewed the modeling results by Dr. Zeng, which were enclosed in your May 5 letter. It appears that Dr. Zeng's analysis of the Interim Operations Plan as he carried it out through November 2006 assumed that the releases from Jim Woodruff Dam would not drop below a minimum flow of 8,000 cubic-feet per second (cfs). The Interim Operations Plan states that from June through February, when basin inflow is between 8,000 and 37,400 cfs, that the releases from Jim Woodruff Dam would be at least 70 percent of basin inflow, but not less than 8,000 cfs. Additionally, when basin inflow drops to below 8,000 cfs, the discharge from Jim Woodruff Dam will equal basin inflow until basin inflow is less than or equal to 5,000 cfs. At that point, the minimum flow will equal 5,000 cfs. Our analysis shows a much less severe impact to system lake levels than that presented by Dr. Zeng when using the specified 5,000 cfs minimum flow from Jim Woodruff versus the much higher 8,000 cfs assumed by Dr. Zeng.

The Corps is continuing discussions with the USFWS concerning the formal Section 7 consultation process. As part of these discussions, we are addressing the impacts of the Interim Operations Plan, including the ramping rates, on upstream reservoir levels. In order to assess these impacts, we plan to conduct hydrological modeling of the Interim Operations Plan, which will also address potential adjustments to the plan if determined necessary. We have discussed with the USFWS your previous offer to assist in developing the best available scientific information which can contribute to the evaluations and findings in the Biological Opinion. Although it would not be appropriate to allow a third party to join the consultation process, both agencies want to assure we are using the most appropriate modeling tools and best scientific information available to assist in completing a biological opinion, and agree that it would be helpful to confer with others with technical modeling expertise. The Corps and USFWS have therefore scheduled a modeling workshop to be held on May 24-25, 2006, at the Lake Seminole Resource Management Office, near Chattahoochee, Florida. The purpose of the workshop will be to assure that there is a common understanding of the elements of the Interim Operations Plan, what it is intended to achieve, and what can be expected to be observed in real time operations when implementing the Interim Operations Plan. The technical group would then assure that the appropriate modeling assumptions, tools, and procedures are selected and implemented to portray the impacts of the Interim Operations Plan or any alternative operations procedures as accurately or closely as possible.

By this letter, we are extending an invitation to the State of Georgia to provide technical representation at the workshop scheduled for May 24-25. The workshop will be scheduled to begin at 10:00 a.m. central daylight time (11:00 a.m. eastern daylight time) on Wednesday, May 24 and should conclude by noon on Thursday, May 25. We only request that attendance at the workshop be limited to technical representatives and that no attorneys be present.

Please notify Ms. Joanne Brandt, Corps Inland Environment Team, of your acceptance of this invitation and provide her with the names of the representatives who plan to attend so we will know who to expect at the workshop. She can be reached by telephone at (251) 690-3260 or by email at: joanne.u.brandt@sam.usace.army.mil.

Sincerely,

LTC, EN

Peter F. Taylor
Colonel, Corps of Engineers
District Commander

Enclosures

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 5, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

Re: Corps ACF Operations

Dear Colonel Taylor:

I am writing to alert you to what the State of Georgia fears could be devastating consequences of the Corps of Engineers' current ACF Basin reservoir operations. Our computer modeling shows that, if the Corps continues on its present course, before the end of this year, the Corps could draw down the federal reservoirs in the ACF Basin to their lowest levels in 50 years and, even worse, could effectively empty them. My staff has tried repeatedly to no avail to exchange information and discuss this with Corps personnel over the past couple of weeks. I request that you review this situation immediately and assure us that the Corps is taking appropriate action to protect the water stored in the ACF Basin reservoirs from significant and unnecessary depletion.

As you know, by letter dated March 7, 2006 to the U.S. Fish and Wildlife Service, the Corps requested initiation of formal consultation regarding the Corps' operations at Jim Woodruff Dam pursuant to Section 7 of the Endangered Species Act. In that letter, the Corps confirmed that, pending completion of the formal consultation, the Corps would operate in accordance with an Interim Operations protocol set forth in the letter and an attached table in an effort to minimize to the extent practicable and feasible adverse effects of the Corps' operation of Jim Woodruff Dam on the listed species within the Basin. That protocol specified the following operational rules:

> During the months of March through May: (a) when Basin Inflows are greater than or equal to 37,400 cubic feet per second (cfs), the Corps would release no less than 37,400 cfs from Woodruff; (b) when Basin Inflows are between 20,400 cfs and 37,400 cfs, the Corps would release between 70% and 90% of Basin Inflows, but not less than 20,400 cfs; and (c) when Basin Inflows are less than 20,400 cfs, the Corps would release 100% of Basin inflows, but not less than 5,000 cfs.

> From June through February: (a) when Basin Inflows are greater than or equal to 37,400 cfs, the Corps would release no less than 37,400 cfs from Woodruff; (b) when Basin Inflows are between 8,000 cfs and 37,400 cfs, the Corps would release between 70% and 90% of Basin Inflows, but not less than 8,000 cfs; and (c) when Basin Inflows are less than 8,000 cfs, the Corps would release 100% of Basin inflows, but not less than 5,000 cfs.
>
> The protocol also set forth certain rules limiting the rates at which the Corps would ramp-down releases (between .25 and 1 foot per day, depending on the current release range) as Basin Inflows fall.

The State of Georgia has been monitoring Basin Inflows since the Corps announced the Interim Operations protocol. According to our data, Basin Inflows have dropped rapidly as the spring has progressed. Over the past several weeks, Basin Inflows have resembled, and in some instances have been lower than, inflows experienced during the severe drought of 2000. The attached memorandum by Dr. Wei Zeng of Georgia EPD, including particularly Figure 1 to the memorandum, compares Basin Inflows during the spring in 2006 and 2000. We are concerned that if climatic conditions do not change significantly, we could continue to see inflow rates through the rest of the year that resemble year 2000 conditions.

We also have been monitoring carefully the Corps' releases from Jim Woodruff Dam this spring and analyzing the potential effect on the federal reservoirs if the Corps continues to operate in its current manner. The Corps' recent operations have resulted in the release of significantly greater than 100% of Basin Inflows. We are unable to determine whether this is wholly the result of the limitations on ramp-down under the Interim Operations protocol or instead is due in part to operational imprecision or error. What we do know is that the over-release of Basin Inflows is significant. From March 15 to the end of April, the Corps released 68,999 cfs-days (136,618 acre-feet) more than Basin Inflows. This amount is equivalent to 56% of Walter F. George's conservation storage, 42% of West Point's, or 12% of Lanier's.

Dr. Zeng's memorandum discusses the potential consequences of the Corps' continued operation of the federal reservoirs under the Interim Operations protocol, assuming that Basin Inflows continue to resemble those of 2000. Dr. Zeng analyzes three scenarios, each of which produces the alarming results, as shown in figures 2 through 4 of the memorandum. Assuming that the Corps were to operate strictly in accordance with the Interim Operations protocol for the rest of the year and did not limit ramp down or otherwise over-release Basin Inflows, Lake Lanier would drop to a level of 1050 feet above mean sea level by the first of November 2006. Lake Lanier has not fallen to this low a level since its early years in the 1950's. Such draw down would place Georgia's water supply, and water quality and biological resources throughout the ACF Basin, in jeopardy, particularly if drought conditions were to continue beyond the end of this year. Over-releases and limitations on ramp-down would exacerbate the draw down, as would the imposition of a minimum flow requirement of greater than 5,000 cfs at the Chattahoochee Gage during the summer months. Any one or a combination of those factors could drain completely the conservation pools of Lake Lanier, West Point, and Walter F. George, the results of which would be nothing less than catastrophic.

I request that you review the situation immediately. Please confirm whether the Corps is releasing any water in excess of that mandated under the Interim Operations protocol.

Furthermore, I request that the Corps perform and share with the State of Georgia as soon as possible its own analysis of the effect of the Corps' continued adherence to the Interim Operations protocol in the event that the current drought conditions continue through this year and beyond. Finally, I request that the Corps proceed with extreme caution and, if necessary, consult with the Fish and Wildlife Service on modification of the Interim Operations protocol so as to avoid substantial depletion of ACF Basin storage.

A prompt response to these concerns would be appreciated by Wednesday, May 10. In follow up, please contact Jim Ussery, EPD Assistant Director, 404/656-4713.

Sincerely,

Carol A. Couch
Director

CAC:ypf

ATTACHMENT

cc: Brigadier General Michael J. Walsh, South Atlantic Division
U.S. Army Corps of Engineers
Governor Sonny Perdue

Memorandum

To: Carol Couch

From: Wei Zeng

Date: May 5, 2006

Re: Projected ACF scenarios under the Corps' Interim Operation Table and Year 2000 – 2001 hydrologic conditions

The following analyses were based on combinations of the assumptions that (1) the Corps operates the ACF projects closely according to its Interim Operation Table, or with a 10% over-release, (2) the hydrologic conditions that we experienced in the period 2000 through 2001 are repeated from this point on, and (3) there is an 8,000-cfs minimum flow requirement imposed to protect endangered mussel species downstream of Jim Woodruff Dam. The assumptions of model simulations are shown in Table 1.

Table 1. Model Assumptions

Model Identifier	Corps compliance with its own Interim Operations	8,000-cfs non-spawning season minimum flow requirement
F0503V2	1. Closely following the Interim Operations 2. Releasing 90% of BI when BI is between 20,400-cfs and 37,400-cfs in spawning season, and 3. Releasing 90% of BI when BI is between 8,000-cfs and 37,400-cfs in non-spawning season	None.
F0503V3	Same as above	Imposed
F0503V4	Similar to F0503V2, but with 10% over-release at Jim Woodruff (close to what we've seen from Mar. 15 to Apr. 30, 2006)	None

All the other conditions remain the same as in our earlier models simulating the Florida ESA demands. These common conditions include year 2000 M&I demands, dry year agricultural irrigation, all federal projects in support of flow requirement downstream of Jim Woodruff, 750-cfs minimum flow requirement at Atlanta, 1,160-cfs minimum flow requirement at Columbus, and other conditions reflected in the ACF Existing Condition model.

Fig. 1 depicts the hydrologic similarity between the first four months of 2006 to the same period in the year 2000. As a matter of fact, from mid-March through the end of April, ACF Basin Inflow in 2006 has been equivalent to or worse than that in the same period in 2000. It will not be unreasonable to assume that something similar to 2000 – 2001 hydrologic conditions may take place from this point on.

The recorded elevations of the ACF federal projects on April 30, 2006 were set to be the starting elevations in the models. Hydrologic conditions from May 1, 2000 through December 31, 2001 were fed into the model as assumed hydrologic conditions for May 1, 2006 through December 31, 2007.

The simulation results are shown in Figs. 2 through 4. The blue curves show recorded project elevations. The other curves show projected elevation changes under different scenarios. These results indicate that even if the Corps operates the ACF projects exactly according to the Interim Operation Table from this point on, a repetition of the 2000 – 2001 hydrologic conditions will result in severe impacts to the reservoirs. Furthermore, if the Corps deviates from its Interim Operation Table, and over-releases by 10%, the impacts would be exacerbated in the form of more significant drawdown and prolonged periods of low elevations. If an 8,000-cfs post-spawning minimum flow requirement is imposed upon the system, the reservoir storage may be completely depleted.

Fig. 5 shows observed flow at Chattahoochee, Florida, as compared to ACF Basin Inflow (derived from the Corps' sheet provided to us earlier) and flow requirements prescribed by the Corps' Interim Operation Table. Summations of the observed flow and of the BI indicate that, from March 15 to the end of April, the Corps has released 68,999 cfs-days (136,618 acre-feet) more than BI. This amount is equivalent to 56% of Walter F. George's conservation storage (42% of that of West Point, and 12% of that of Lanier).

Three additional simulations have been made to show potential scenarios under the Corps' Interim Operation Table. These simulations are similar to the ones summarized in the earlier part of this memorandum, except that in these ones, I assumed the Corps would pass only 70% of ACF Basin Inflow (when Basin Inflow is in the intermediate range, i.e. between 20,400-cfs and 37,400-cfs for March through May, and between 8,000-cfs and 37,400-cfs for June through February) downstream of Jim Woodruff Dam, the most conservative approach in the framework of the Interim Operation Table.

The assumptions of these additional model simulations are shown in Table 2.

All the other conditions remain the same as in earlier analyses.

The simulation results are shown in Figs. 6 through 8. The blue curves show recorded project elevations. The other curves show projected elevation changes under different scenarios.

Table 2. Assumptions of Additional Model Simulations

Model Identifier	Corps compliance with its own Interim Operations	8,000-cfs non-spawning season minimum flow requirement
F050506	4. Closely following the Interim Operations 5. Releasing 70% of BI when BI is between 20,400-cfs and 37,400-cfs in spawning season, and 6. Releasing 70% of BI when BI is between 8,000-cfs and 37,400-cfs in non-spawning season	None
F0505V2	Similar to F050506, except there is a 10% over-release at Jim Woodruff Dam.	None
F0505V3	Same as F050506	Imposed

If the 2000 – 2001 hydrologic conditions were to be repeated for the rest of this year and next year, under the most conservative approach prescribed by Corps' Interim Operation Table, The following things may happen.

(1) Lanier elevation (Fig. 6) may approach the historic low of 1052 feet at the turn of the year, and set new record low the next year, though the elevations were slightly higher than shown in Fig. 2. West Point and Walter F. George elevations (Figs. 7 and 8) may be higher than shown in Figs. 3 and 4, where 90% of Basin Inflow is released to downstream of Jim Woodruff Dam.

(2) A 10% over-release at Jim Woodruff Dam would set record low at Lanier in the fall this year, and again next year. It will also cause an additional drawdown of 2 to 4 feet at West Point and of 1 to 2 feet at Walter F. George.

(3) An 8,000-cfs non-spawning season minimum flow requirement downstream of Jim Woodruff Dam is not sustainable. It will drain all the projects in the ACF system, and cause them to be empty for prolonged period.

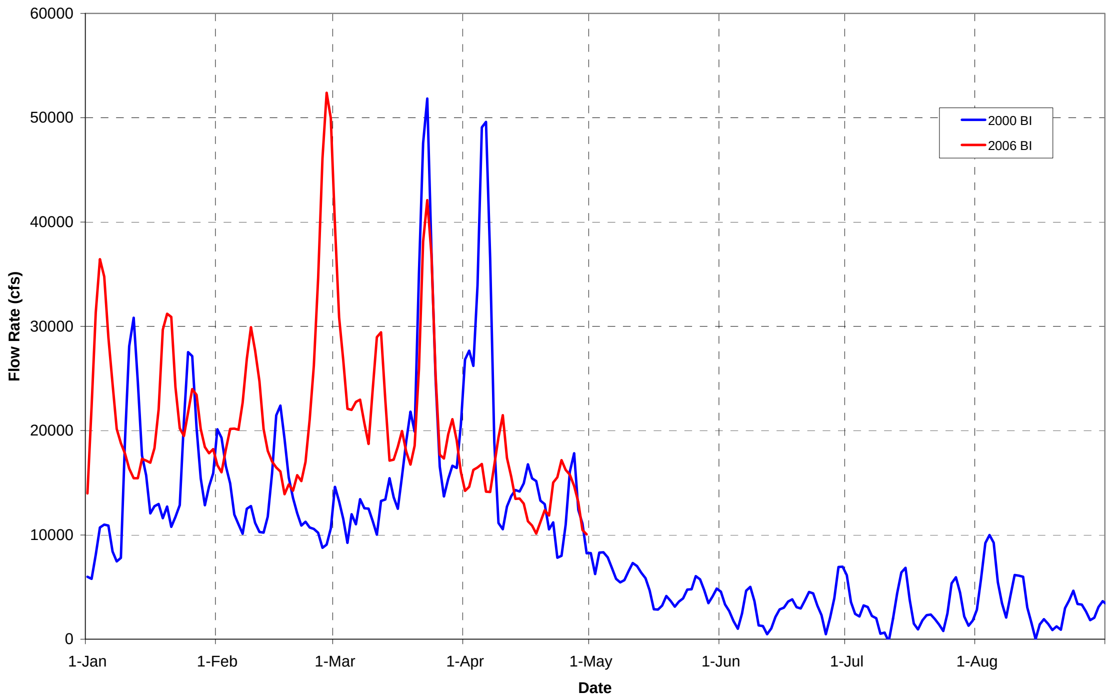


Fig. 1 Comparison of ACF Basin Inflows (down to Jim Woodruff) in 2006 and 2000

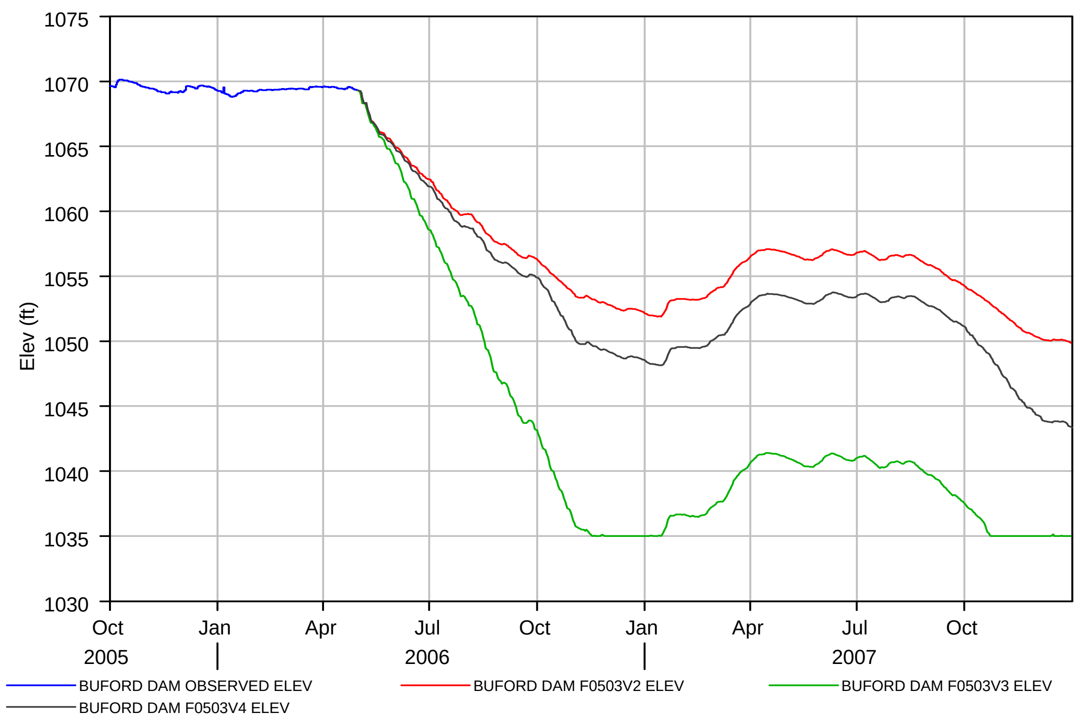


Fig. 2 Projected Lanier elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (90% BI release)

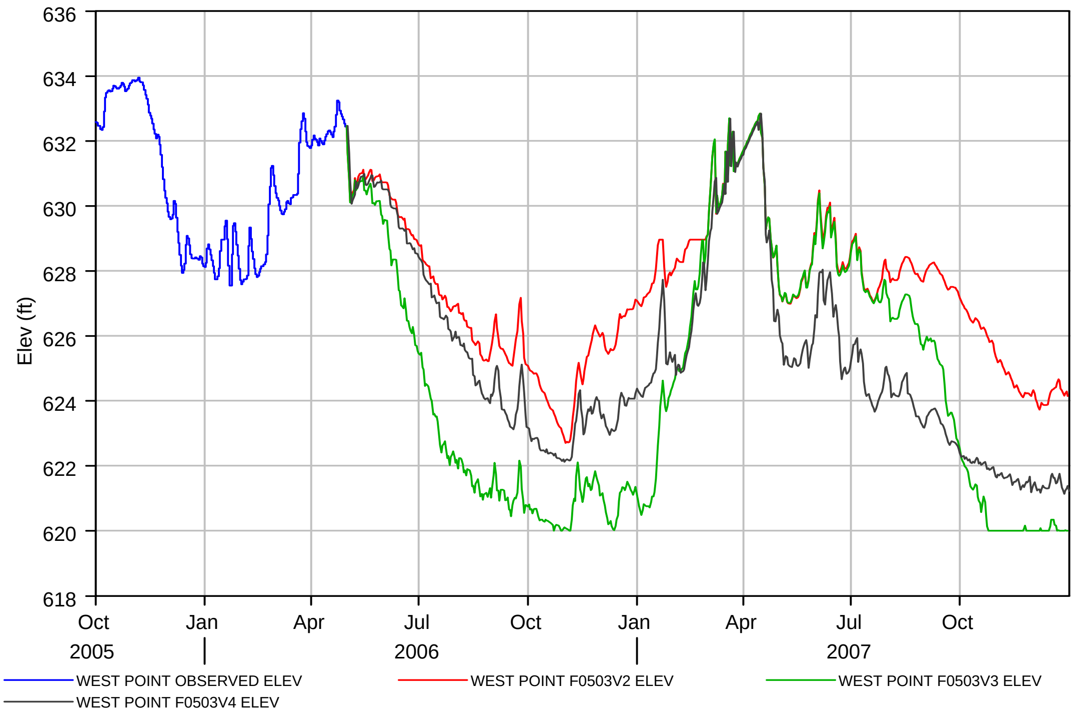


Fig. 3 Projected West Point elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (90% BI release)

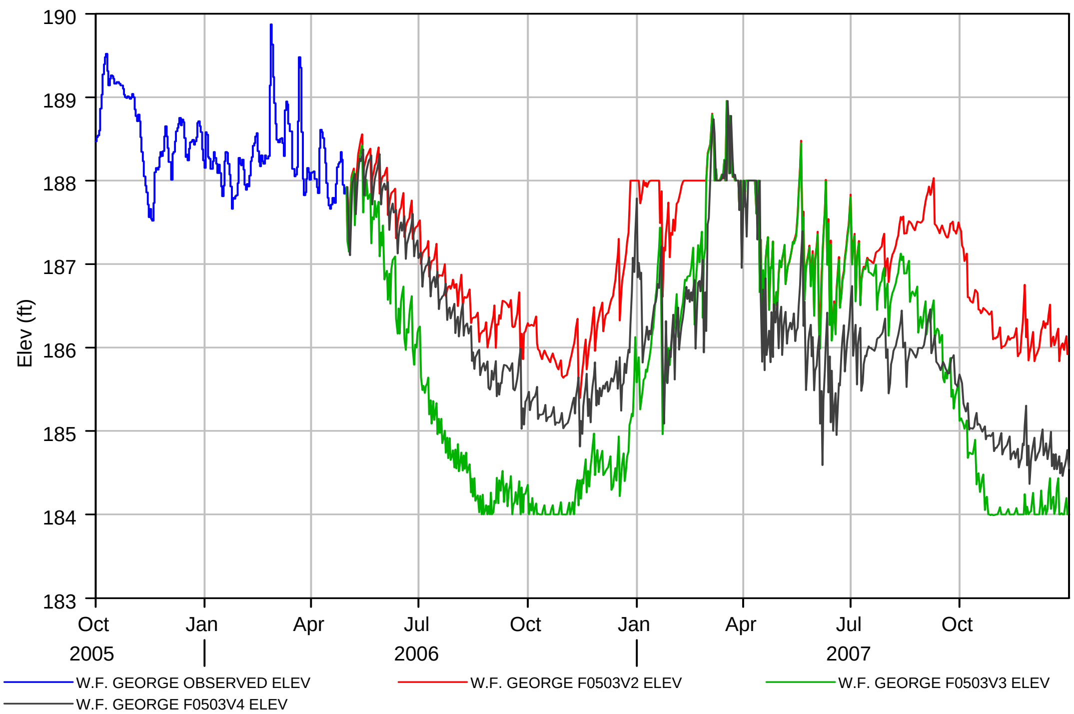


Fig. 4 Projected Walter F. George elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (90% BI release)

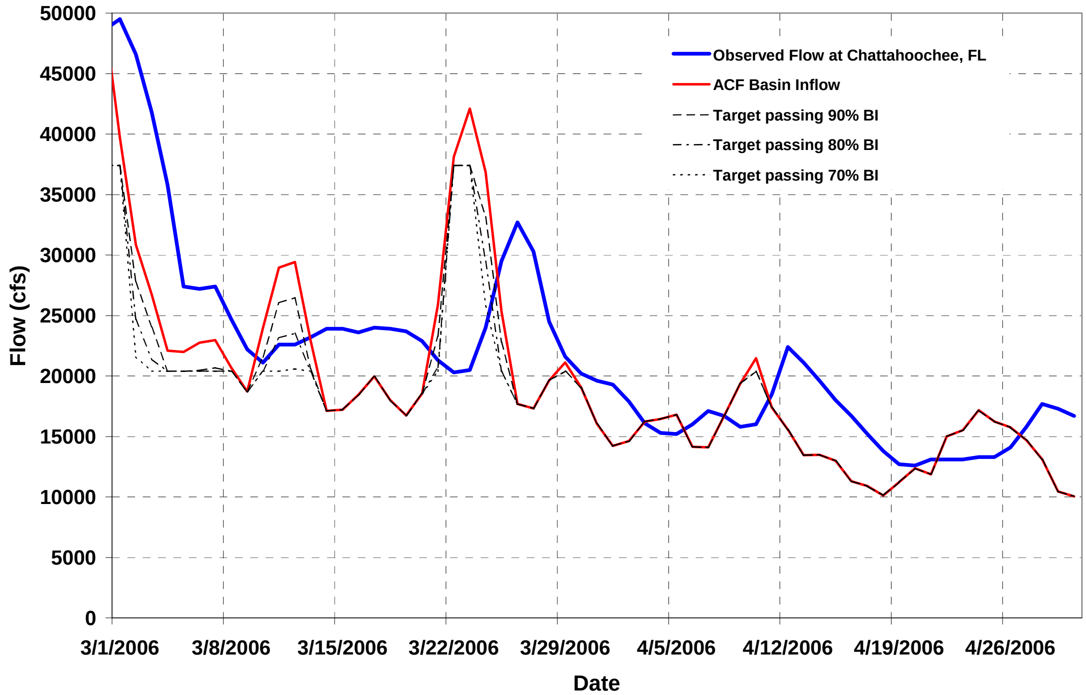


Fig. 5 ACF Basin Inflow and COE actual operation of Jim Woodruff Dam

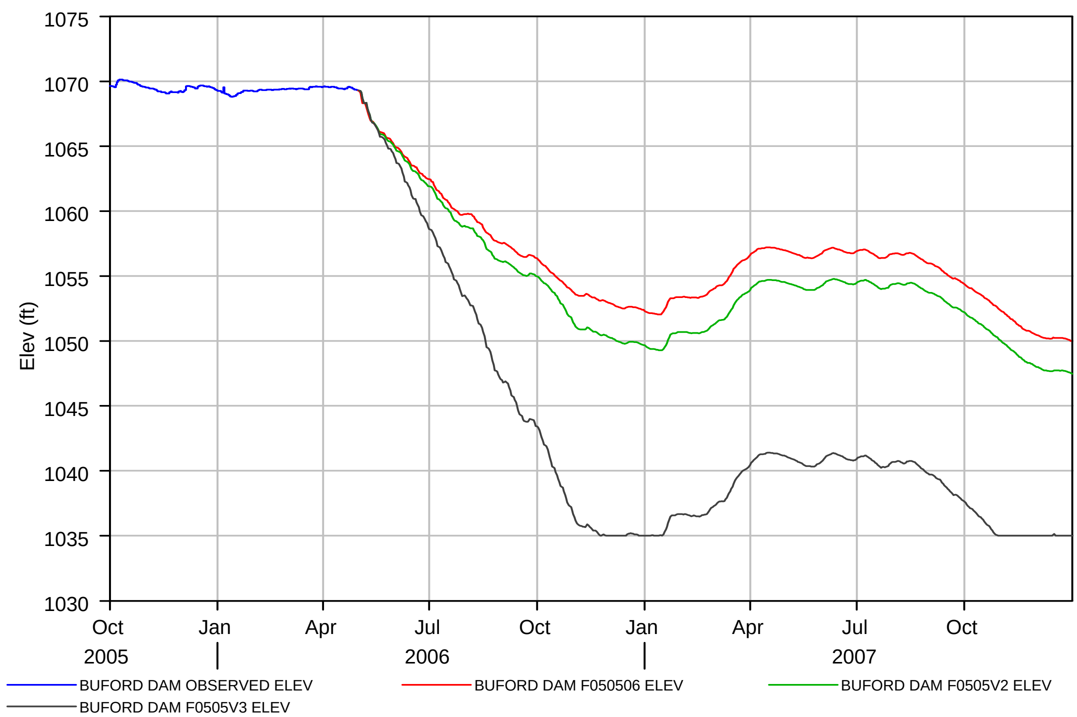


Fig. 6 Projected Lanier elevations under Corps Interim Operations and Year 2000 - 2001 hydrologic conditions (70% BI release)

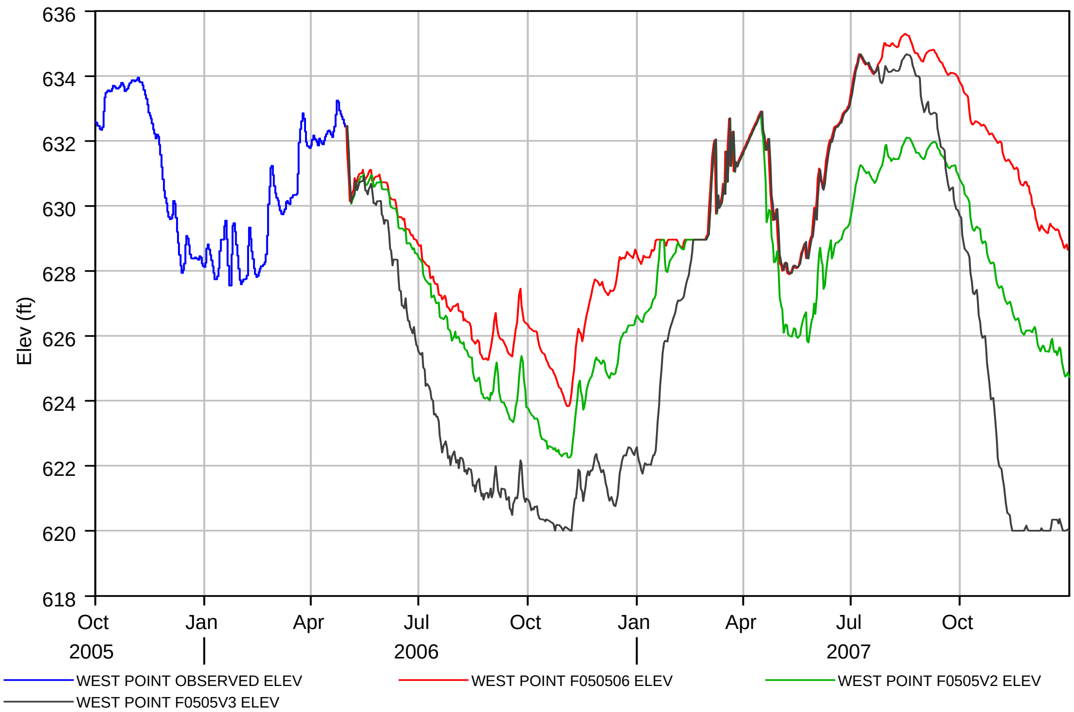


Fig. 7 Projected West Point elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (70% BI release)

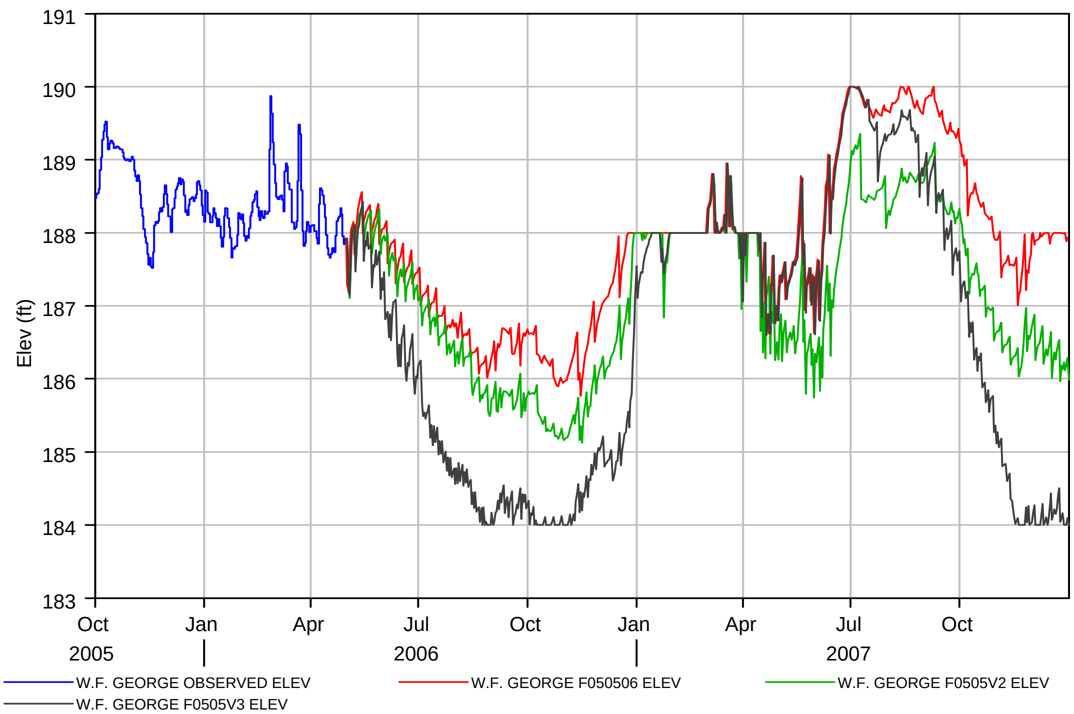


Fig. 8 Projected Walter F. George elevations under Corps Interim Operations and Year 2000 – 2001 hydrologic conditions (70% BI release)

D-19 GA-EPD letter to CESAM dated 17 May 2006

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 17, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

Re: Corps ACF Operations

Dear Colonel Taylor:

I received your letter of May 15, 2006 in response to my letters of March 24, 2006 and May 5, 2006. I and members of my staff will attend the workshop that you have proposed for May 24-25 to discuss the Corps' Interim Operations and alternative operations procedures. As your letter notes, I have requested repeatedly that the Corps and the Fish and Wildlife Service allow Georgia the opportunity to provide input during the course of the current Endangered Species Act formal consultation. The necessity for us to do so has become more evident as we have observed the effects of the Corps' Interim Operations.

On that point, please allow me to clarify the computer modeling that I shared with my May 5, 2006 letter, as there appears to be a significant misunderstanding regarding assumptions that has caused the Corps to discount the validity of Georgia's concerns. In your letter, you state that Georgia's modeling runs "assumed that the releases from Jim Woodruff Dam would not drop below a minimum of 8,000 cubic-feet per second (cfs)." You point out that the Interim Operations protocol establishes a minimum flow of only 5,000 cfs and conclude that modeling the Interim Operations with a 5,000 cfs minimum flow produces much less severe results. In fact, however, of the six model runs that were summarized in the memorandum that accompanied my letter, only two (Runs F0503V3 and F0505V3) assumed a minimum flow of 8,000 cfs. The other four assumed that the minimum flow would be 5,000 cfs.[1]

While it is true that the results are less severe when one assumes a minimum flow of 5,000 cfs rather than 8,000 cfs, the results of all the runs are severe nevertheless. For example, as Runs F0503V2 and F0505V2 show, operating according to the Interim Operations under year 2000 conditions could draw down Lake Lanier to an elevation of 1050 feet, an elevation lower

[1] You will note that in the two charts in Dr. Zeng's memorandum that summarize the assumptions of the models, six of the eight runs have the word "none" in the column labeled "8,000-cfs non-spawning season minimum flow requirement." This was intended to indicate that the 8,000 cfs minimum was not assumed in those runs.

than any seen since the 1950's. Draining Lake Lanier to such a low level could cause serious harm throughout the ACF Basin in 2006 and for years to come. If the Corps continues to release in excess of 100% of Basin Inflows (as it is doing now), or must maintain a minimum flow of greater than 5,000 cfs, Lake Lanier and other the federal reservoirs will fall further and could reach the bottom of their conservation pools. For these reasons, Georgia remains extremely concerned about the Corps' Interim Operations and believes that the Corps and Fish and Wildlife Service should carefully evaluate whether they should be modified prior to the completion of the formal consultation.

I request that the Corps' technical staff once again review the modeling results that I have provided in light of the above clarification. We would be pleased to provide you with additional information to assist you in your analysis. In return, I request that the Corps share with Georgia's technical team the Corps' own computer modeling of the Interim Operations under the same assumptions and any other assumptions that the Corps has evaluated. If indeed the Corps does not share Georgia's fears about the potential effect of the Interim Operations, we would like to understand the basis for the Corps' conclusions.

Given the seriousness of Georgia's concerns, I request that you respond to the above requests as soon as possible. It would greatly aid our discussions in the workshop if the Corps would respond before May 24. Thank you again for your attention to this matter.

Sincerely,

Carol A. Couch
Director

cc: Brigadier General Michael J. Walsh, South Atlantic Division, U.S. Army Corps of Engineers
Governor Sonny Perdue
Ms. Joanne Brandt, Corps of Engineers Inland Environmental Team

D-20 CESAM letter to GA-EPD dated 19 May 2006

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

May 19, 2006

REPLY TO
ATTENTION OF

Plan Formulation Branch
Planning and Environmental Division

Dr. Carol A. Couch, Ph.D, Director
Environmental Protection Division
Georgia Department of Natural Resources
2 Martin Luther King, Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch:

Thank you for your letter of May 17, 2006, which provided clarification of Dr. Zeng's modeling results previously furnished in your May 5, 2006 letter. You also expressed concerns regarding the impact of the Interim Operation Plan on the ACF system. Our review of Dr. Zeng's modeling is underway. At the workshop scheduled for May 24-25, 2006, we will be presenting our assumptions and model results and we will listen to any concerns that the states may have. I appreciate your desire to provide input regarding the Interim Operations Plan. Both the U.S. Army Corps of Engineers and the U.S. Fish and Wildlife Service want to convey that we are using the most appropriate modeling tools and best scientific information available to assist in completing a biological opinion. This can best be accomplished by conferring with others, such as Dr. Zeng, who has technical modeling expertise.

Although we have not completed our review, we have identified several different model input assumptions that may be contributing to differences in our modeling results. One such area of difference may be the consumptive water use demands. We are using the actual 2000-2001 consumptive use demands in our calculations. If a different demand set were used, for example the projected 2030 demands, results could differ appreciably. Another area that could greatly influence model results would be the hydropower demands placed on each reservoir project. We have assumed that due to the current basin-wide low flow conditions, coupled with the flows required under the interim operations plan, that we would not place heavy firm energy requirements on Buford if drought conditions develop and persist in the basin. If high firm energy demands were placed in the model at Buford in addition to the demands of the Interim Operations Plan, lake levels could be expected to be lower later in the year. There are many other modeling assumptions that could influence estimated future pool levels; model time step, inflow data sets used, ramping rates below Jim Woodruff, and assumptions regarding the level of flow support from each system reservoir, to name a few, and we look forward to discussing next week.

We are open to sharing our modeling information and assumptions necessary for your modelers to capture the operations of the system and to incorporate the Interim Operations plan into the models. It is our hope that causes for differences in model results can be determined and clarified at the modeling workshop to be held on May 24-25, 2006. Our modelers and water managers will be in attendance and prepared to discuss modeling techniques, assumptions, and data to assist all parties reach a common understanding of the Interim Operations Plan and its effects on the entire ACF system.

We look forward to working with all the modelers at the workshop next week.

Sincerely,

Peter F. Taylor, Jr.
Colonel, Corps of Engineers
District Commander

D-21 GA-EPD letter to CESAM and USFWS dated 1 June 2006

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

June 1, 2006

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

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

Re: ESA Consultation on Corps of Engineers' Operation of Jim Woodruff Dam

Dear Col. Taylor and Ms. Carmody,

In follow up to my prior correspondence and the workshop that the Corps of Engineers and Fish and Wildlife Service hosted on May 24-25, 2006, I am writing to express the State of Georgia' continued concerns about the Corps' Interim Operations and the ongoing consultation pursuant to Section 7 of the Endangered Species Act, and to request an extension of the consultation. As discussed below, the State of Georgia requests (1) that the Corps thoroughly reconsider the Interim Operations in light of the State of Georgia's findings that the continued operation of the federal reservoirs in the ACF Basin thereunder is unsustainable and threatens not only the endangered species but other vital needs within the Basin; (2) that, during any delay in replacing the Interim Operations with an alternative management protocol, the Corps immediately undertake measures identified by the State of Georgia to mitigate the negative effects of the Interim Operations; and (3) that the Corps and the Fish and Wildlife Service extend the consultation so that the Corps and the Service have the opportunity to consider the best scientific and commercial data on the endangered and threatened species and the hydrologic data and analysis necessary to meet the needs of those species while meeting the other vital needs within the Basin.

1. Reconsideration of the Interim Operations

The State of Georgia has demonstrated that the Interim Operations have the potential to produce very harmful effects within Georgia and throughout the ACF Basin. As explained in my letter of May 5, 2006 and the memorandum by Dr. Wei Zeng attached to that letter, the Interim

Operations could draw Lake Lanier down to levels not seen since it first was constructed in the 1950's, or, even worse, could completely deplete the storage of all of the federal reservoirs in the ACF Basin. The possibility of this occurring is not remote; indeed, given the current extremely dry conditions, low reservoir and river levels are a very real danger. This, in turn, could produce lower flows in the Apalachicola River than any that have been seen in history. Even if the consequences this season are not this dire, our analysis indicates that the flows prescribed under the Interim Operations cannot be sustained in dry conditions such as this on a multi-year basis.

To date, we have received nothing from the Corps in written response or during the workshop that would indicate that our analysis is incorrect or our fears unfounded. Rather, the clear impression that we derive from the Corps' correspondence and remarks of Corps personnel at the workshop is that the Corps, prior to the request for consultation, had not undertaken a thorough and appropriate analysis of the Interim Operations, and is waiting until after the formal consultation is completed to consider making the necessary changes to reservoir operations to address the concerns that Georgia has raised. In our view, these issues are too important not to be considered and acted upon right away.

Of additional concern is that the proposed action (some manner of implementing the Interim Operations) is unclear and ill defined. In short, we are not certain of the proposed action being reviewed. In response to Georgia's concerns about over-releases of Basin Inflows (discussed further below), for example, the Corps in the workshop explained that the instructions regarding the release of certain percentages (including 100%) of Basin Inflows constituted a minimum and not an upper bound on releases from Jim Woodruff Dam. The Interim Operations table and narrative set forth in the formal consultation letter do not indicate that there is no upper bound on releases, and this was the first that Georgia had heard of this interpretation. This interpretation is alarming because without any upper bound on releases, the Corps and the States cannot evaluate fully the effects of the Interim Operations and ensure that they will not cause great damage to the Basin.

We acknowledge that in the formal consultation letter, the Corps expressly reserved the right to alter the flow numbers prescribed by the Interim Operations "based on better information that may be developed during the Section 7 consultation process." We request that the Corps undertake the appropriate analysis and reconsider the Interim Operations to ensure that the Corps conserves the water resources of the ACF Basin to meet vital needs throughout the ACF Basin, including but not limited to the needs of the protected species.

2. Mitigation of Adverse Impacts of Operating under the Interim Operations

Even within the parameters of the Interim Operations, the Corps is not taking all of the actions that it could to conserve water and mitigate adverse consequences of the Interim Operations. For example, despite knowing that the Interim Operations prevent the Corps from ramping down releases as rapidly as Basin Inflows are dropping, the Corps has failed to limit its ramp-up of flows in response to rainfall so as to prevent a significant aggregate over-release of Basin Inflows. Rather than releasing the required percentage of Basin Inflows, the Corps has on repeated occasions released more than 100% of Basin Inflows. We also have asked that while the current dry conditions persist, the Corps commit to reducing or eliminating peaking power generation at Buford Dam to the extent that it would involve releases in excess of those needed for other purposes. While Corps personnel have said that the Corps would likely shift power demand from Lake Lanier to other projects under such conditions, we have no commitment from the Corps that it actually will do so. In light of falling reservoir levels and our projections of reservoir levels that result this year, the Corps' failure to assure us that it is undertaking all actions permissible under the Interim Operations to conserve water is untenable.

Corps personnel did indicate at the workshop that the Corps would consider certain alterations of its management under the Interim Operations to conserve water. These include determining Basin Inflow to be released based upon a seven-day average rather than a three-day average, and determining compliance with the Interim Operations based upon a comparison of the flows at the Chattahoochee gage with Basin Inflows. Please confirm whether the Corps will indeed implement these modifications to its procedures and any other improvements that the Corps intends to implement.

The State of Georgia hereby requests that the Corps commit to take whatever actions is necessary, including those measures outlined above, to ensure that the flow requirements in the Interim Operations are not exceeded and that water is conserved in storage to the maximum extent possible, at least until the reservoirs can be restored to a safe level.

3. Extension of Formal Consultation

Finally, while the Corps has determined that the flows prescribed under the Interim Operations are sufficient to meet the needs of the Gulf sturgeon and protected mussels, there exists a serious question as to whether those flows are necessary or sustainable. The Corps' formal consultation letter indicates that the flow numbers governing the Gulf sturgeon spawn were based on very limited data from four data points observed during the relatively wet conditions of 2005. As you are well aware, 2006 has been significantly drier than 2005, and the flows in the Apalachicola River have been lower this year than last. We are aware of no data indicating that the flows prescribed based upon 2005 conditions were necessary to allow a successful spawn during a drier conditions such as those that we are now experiencing. Furthermore, it has become increasingly apparent during the workshop that neither the Corps nor the Fish and Wildlife Service have adequate data or feel compelled to develop data from which to determine whether the flows observed in 2005 and prescribed under the Interim Operations are actually needed.

We understand that a study is underway and will be completed in the coming weeks regarding the 2006 Gulf sturgeon spawn in the Apalachicola River. No responsible determinations can be made until this data and other data is considered that bears on what flows are actually necessary and prudent to support the Gulf sturgeon spawn and the protected mussels. Completing the consultation without such information could allow over-releases of water that jeopardize the needs of the Gulf sturgeon and protected mussels in this or future years, not to mention jeopardizing Georgia's water supply and other needs.

The Corps and the Service must extend the consultation as necessary to fully consider the concerns that Georgia has revealed. The Endangered Species Act states "the policy of Congress that Federal agencies shall cooperate with State and local agencies to resolve water resource issues in concert with conservation of endangered species." Endangered Species Act § 2(c)(2), 16 U.S.C. § 1531(c)(2). The Service's Consultation Handbook instructs the Service to "request an information update from State agencies prior to preparing the final biological opinion to ensure that the findings and recommendations are based on the best scientific and commercial data available." Consultation Handbook at p. 2-16. The Corps and the Service have the authority to extend the consultation. 50 C.F.R. § 402.14 (e). When the Service determines that additional data would provide a better information base from which to formulate a biological opinion, it may request an extension of formal consultation and request that the Corps obtain additional data. 50 C.F.R. § 402.14 (f). In any event, the Service has the responsibility to review all relevant information provided by the Corps as well as all information that is otherwise available. 50 C.F.R. § 402.14 (g)(1). By not considering all necessary and appropriate information, the Corps and Fish and Wildlife Service are only creating for themselves the immediate obligation to undertake an addition consultation. See 50 C.F.R. § 402.16 (stating that action agency must reinitiate formal consultation if new information reveals effects of the action that may affect listed species or critical habitat in a manner or to an extent not previously considered).

Please inform me promptly as to the actions that you propose to undertake in response to the above concerns. In the meantime, the State of Georgia's analyses of the Interim Operations and the consultation are ongoing. We will continue to provide you with input as we develop additional information.

Thank you for your cooperation and assistance.

Sincerely,

Carol A Couch

Carol A. Couch
Director

cc: Governor Sonny Perdue
Brigadier General Michael J. Walsh, South Atlantic Division, U.S. Army Corps of Engineers
Ms. Joanne Brandt, Corps of Engineers Inland Environmental Team

D-22 GA-EPD letter to CESAM and USFWS dated 2 June 2006, with modeling memorandum

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

June 2, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

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

Re: Updated Simulation of Corps of Engineer's Interim Operations Plan

Dear Col. Taylor and Ms. Carmody:

As I stated in my letter to you of June 1, 2006, I am providing you additional results of the simulation of the Interim Operations Plan updated using data and information provided during the May 24-25, 2006 modeling workshop. The attached memorandum, dated June 1, 2006, from Dr. Wei Zeng summarizes these updated simulations and the assumptions used.

The most significant variation among the five modeled simulations is caused by the impact of firm power generation modeled to closely follow the 1989 proposed Water Control Plan. Even though the reservoirs stay above the bottom of the conservation pool without firm power generation, because of the magnitude of flow requirements under the Interim Operations Plan, they fail to refill in numerous years and stay unfilled for prolonged periods.

Each of the remaining four simulations show the same pattern of devastating and unsustainable loss of storage with reservoirs reaching the bottom of pools and staying there for prolonged periods. In addition to impacts on hydropower, water supply and quality, spawning of warm water fish species in the reservoirs will be seriously jeopardized as much as two thirds of the time.

Colonel Peter Taylor and Ms. Gail Carmody
June 2, 2005
Page Two

I repeat my request that the Corps take immediate and decisive action to stop releasing more water than required, to properly and completely evaluate impacts on federal and state purposes, and to extend the timeframe of the consultation to allow the use of data from the 2006 sturgeon spawn that will reportedly be released by the State of Florida sometime in July 2006.

Sincerely,

Carol A. Couch
Director

CAC:ypf

ATTACHMENT: June 1, Memo

cc: Governor Sonny Perdue
Brigadier General Michael J. Walsh, South Atlantic Division, U.S. Army Corps of Engineers
Ms. Joanne Brandt, Corps of Engineers Inland Environmental Team

Memorandum

To: Carol Couch
From: Wei Zeng
Date: June 1, 2006
Re: HEC-5 simulation of the Corps of Engineer's Interim Operation Plan

We have developed HEC-5 models to simulate the Corps of Engineer's (Corps) Interim Operation Plan (IOP). These models are all based on the "Black and White" platform model (FBA08017.DAT), agreed upon by the three States and the Corps during the ACF Comprehensive Study as that most closely reflecting the 1989 Draft Water Control Plan.

These models retain Water Control Plan (WCP) rule curves, zone definitions, and power guide curves. All have year 2000 Georgia Municipal and Industrial demands and dry year agricultural demands obtained from previous Georgia EPD studies. The models have the same in-stream flow requirements at Atlanta (750 cfs), Georgia and Columbus (1850 cfs when West Point elevation is greater than 621.6 ft-msl and 1200 cfs when West Point elevation is less than 621.6 ft-msl). The models we have developed all include IOP flow requirements downstream of Jim Woodruff Dam, and utilize storage in all four Corps ACF reservoirs (Lanier, West Point, George and Woodruff) to meet these requirements, balancing to the extent permitted by WCP zones. Our models also eliminate navigation windows embodied in the Black and White platform model. We have also incorporated those provisions of the Corps' HEC-5 models provided to us during the May 24-25, 2006 workshop insofar as they are consistent with the WCP.

The principal assumptions and parameters of our models are listed in Table 1 below:

Model Identifier	Passing percentage of Basin Inflow when BI is in the intermediate range	Source of Basin Inflow	Additional Conditions
FIPBW2	90%	Corps	
FIPBW3	70%	Corps	
FIPBW4	90%	Georgia EPD derivation from Corps template	
FIPBW5	90%	Georgia EPD derivation from Corps template	No agricultural demands
FIPBW6	90%	Corps	No firm power requirements

The intent of the first two models (FIPBW2 and FIPBW3) was to simulate the effect of the imposition of the Corps-derived IOP flow requirements on the current Water Control Plan, based on the Corps-calculated Basin Inflows (BI).

The results of these simulations can be seen in Figures 1 through 6 (blue and red curves for FIPBW2 and FIPBW3, respectively). The impact of the IOP combined with the Water Control Plan on the reservoirs is so severe as to be potentially catastrophic, not only to original project purposes, but to public water supply, water quality, reservoir and river ecosystems as well. The most serious deficiency of the IOP is that it does not allow the reservoirs to be refilled to their summer rule curves in dry years (as we are currently experiencing), thereby greatly increasing the risks of storage depletion during extended regional droughts. The reservoirs reach the bottom of their conservation pools and remain empty for months on end (more than a year in some instances) several times during the historical period of record, with 1980's and 1999-2001 hydrologic conditions shown in the Figures below. Note that the unimpaired flow record used for the modeling does not extend beyond 2001, so that the full critical period impacts of the IOP have not yet been determined either by Georgia or the Corps, a matter of serious and obvious concern.

Georgia EPD developed its Basin Inflow time series by populating the Corps' BI calculation template with the Corps' project data. On average, Georgia BI values appear to be substantially greater than the Corps' data accompanying the workshop models. The FIPBW4 model was developed to investigate the sensitivity of the analysis to BI and resulting target flows. While some differences in timing and extent of drawdown can be observed in the Figures, the fact remains that under any reasonable method for calculation of BI, the IOP empties the reservoirs on multiple occasions and for long periods of time over the historical record.

The FIPBW5 model is a sensitivity run designed to evaluate the effects of Georgia's agricultural water usage. At the May 24-25, 2006 workshop, questions were asked about what agricultural demands should be used. The purpose of this run is to see if any differences in agricultural demands can make a difference under the IOP. The results (green curves vs. black ones) show there is some difference in reservoir elevations. However, this difference does not change the conclusion that the IOP will empty the reservoirs, only when and for how long.

The FIPBW6 evaluates the impact of WCP firm power requirements imposed on the "Black and White" model. As shown by the purple lines in the Figures below, generation of power only in conjunction with IOP-prescribed releases can maintain Lanier pool elevation above 1057 ft, West Point about 3 feet and Walter F. George about a foot above their respective inactive pool levels. However, even with the complete elimination of firm power, the reservoirs are drawn down substantially and remain less than full for years on end, due to their perennial inability to refill in the spring under the IOP.

It should be noted that the most serious impacts of the IOP are not low reservoir elevations per se but the resulting (in all simulations but FIPBW6) critical disruptions of public water supplies at Lanier, Atlanta, and West Point, and the drying up of the Chattahoochee River at Atlanta and Columbus once the reservoirs have been emptied. In addition, water quality and the environment throughout the ACF Basin will be severely impacted by empty reservoirs; Figure 7 shows that, with Georgia-derived Basin Inflow and flow requirements, the 5000-cfs minimum flow requirement for mussels downstream of Woodruff Dam for endangered mussels is violated, indicating that the differences between Corps and GA BIs need to be further investigated.

According to the Corps' February 2005 Draft SAM Standard Operating Procedure (SOP) 1130-2-9, the Corps should operate for fish spawn in the ACF reservoirs in the following manner: Fish spawn operations at Lake Lanier and West Point Lake begin April 1 and last for four weeks, during which time the lakes are to be maintained above critical elevations of 1069.1 at Lanier and 631.3 at West Point. Fish spawn operations begin March 17 at Walter F. George and last for four weeks, with 187.6 the critical elevation to be maintained. Fish spawn operations at Lake Seminole begin on March 1 and last for four weeks, with 76.8 the critical elevation to be maintained. Table 2 below displays our analysis of SOP violations under the IOP (as simulated in our models), assuming violations occur when reservoirs drop more than ½ foot from the critical elevations during the respective 4-week periods.

Table 2: Number of years in which fish-spawn SOP violations occur (out of 63 in period of record)

Model	Lanier	West Point	Walter F. George	Jim Woodruff
FIPBW2	34	37	42	13
FIPBW3	25	31	27	8
FIPBW4	32	30	32	11
FIPBW5	27	30	28	7
FIPBW6	20	32	42	15

Table 2 shows that fish-spawn SOP violations occur in half to two-thirds of the years simulated, the environmental harm due to which should be evaluated by our biologists using this information.

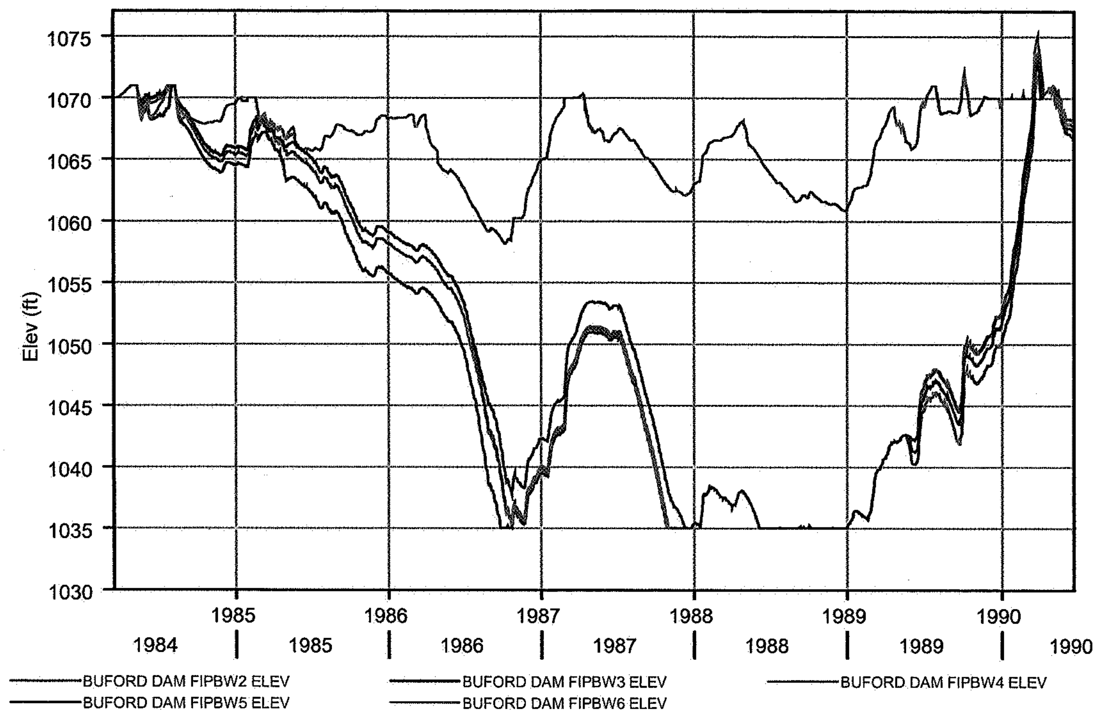


Fig. 1 Simulated Lanier elevation for the 1980's

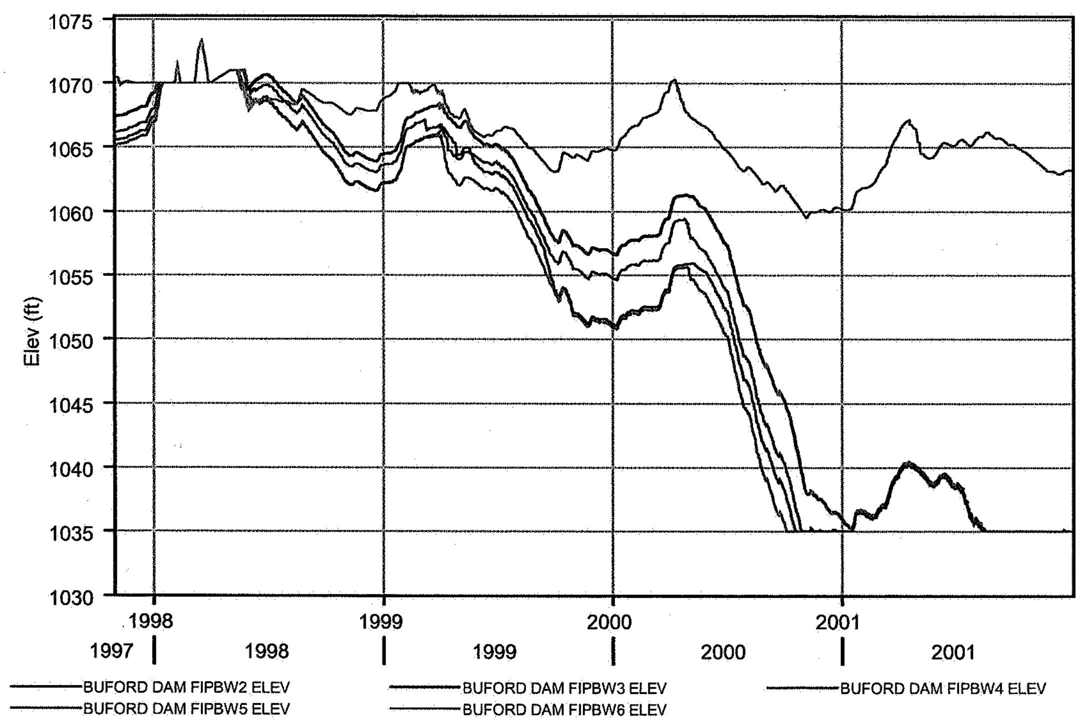


Fig. 2 Simulated Lanier elevation for the turn of the century

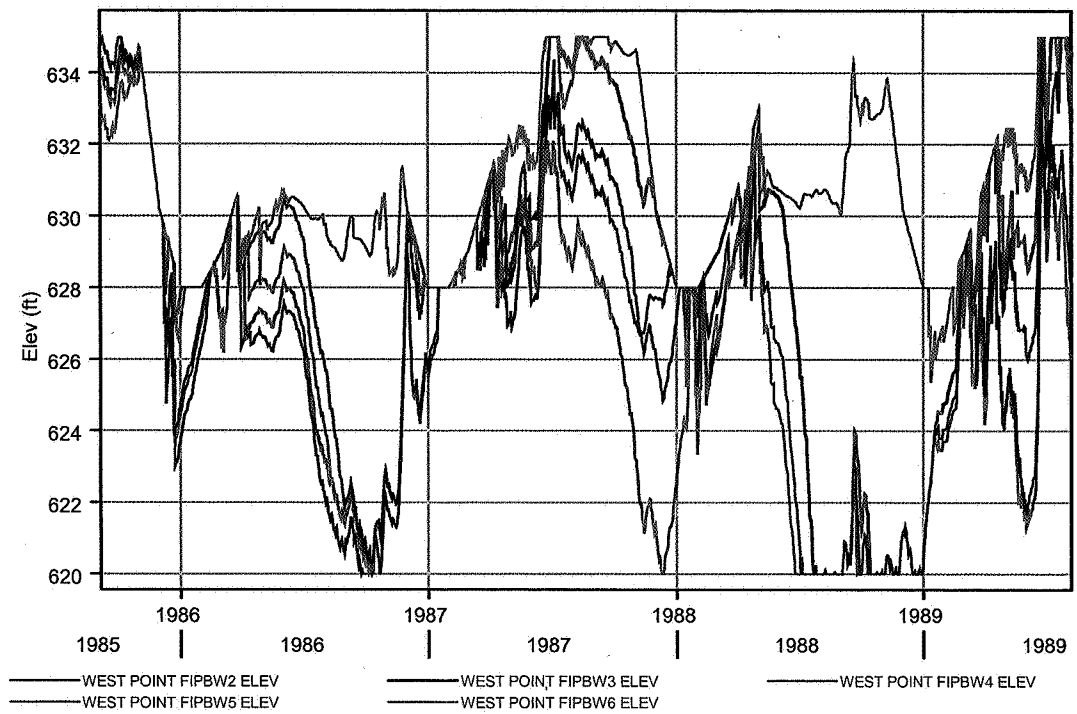


Fig. 3 Simulated West Point elevation for the 1980's

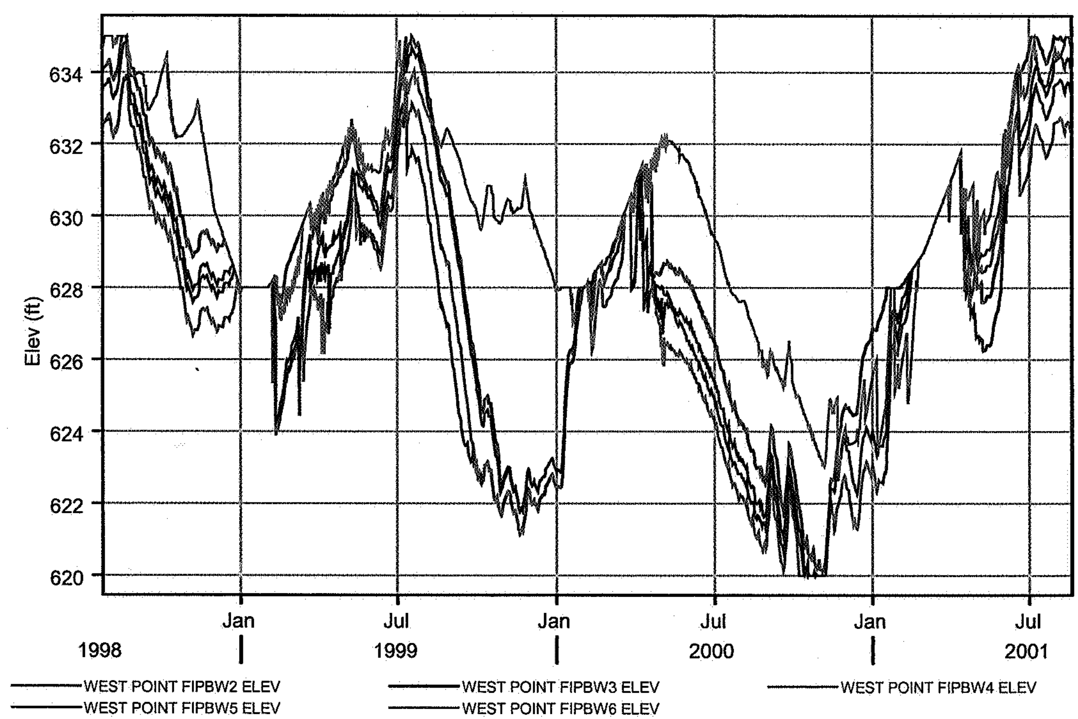


Fig. 4 Simulated West Point elevation for the turn of the century

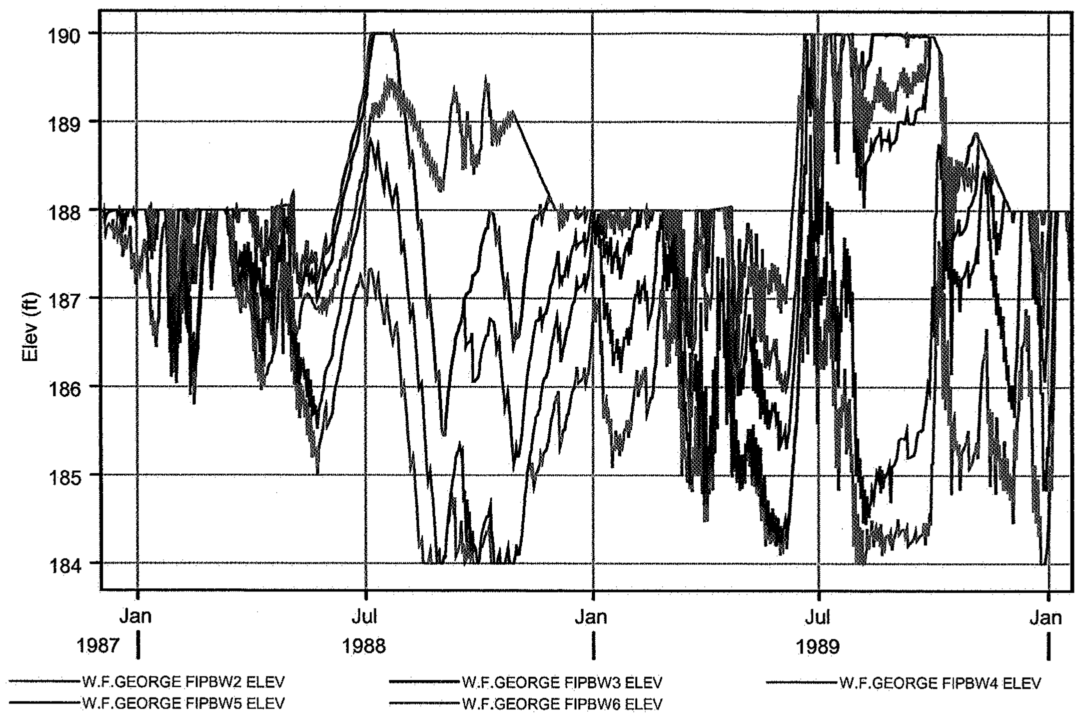


Fig. 5 Simulated Walter F. George elevation for the 1980's

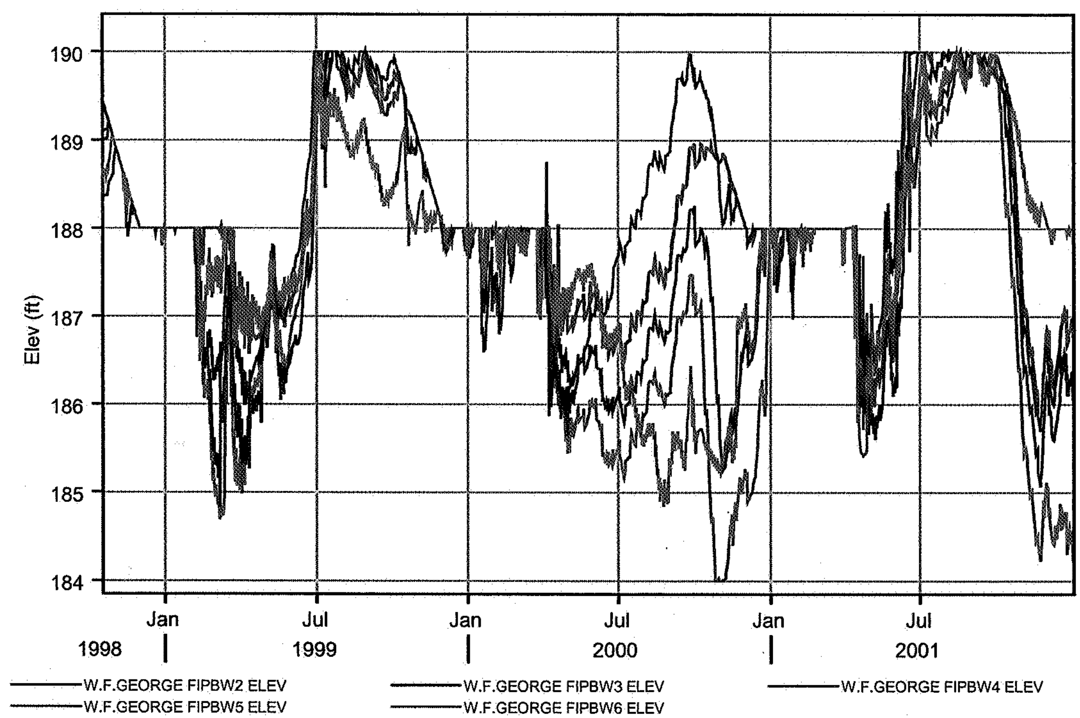


Fig. 6 Simulated Walter F. George elevation for the turn of the century

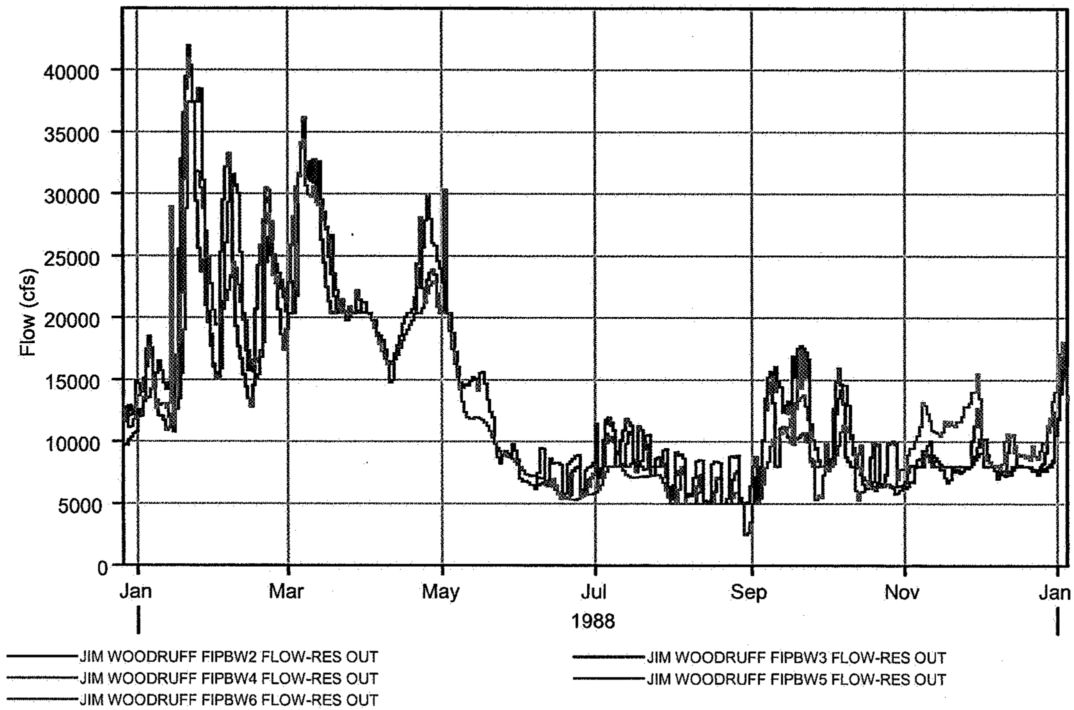


Fig. 7 Simulated Jim Woodruff outflow in the year 1988

D-23 Georgia Governor Perdue letter to Secretary of the Army Harvey dated 2 June 2006, requesting adjustments to IOP and extension of consultation period

STATE OF GEORGIA
OFFICE OF THE GOVERNOR
ATLANTA 30334-0900

Sonny Perdue
GOVERNOR

June 2, 2006

The Honorable Francis J. Harvey
Secretary of the Army
The Pentagon
Washington, D.C. 20301

Dear Secretary Harvey:

The purpose of this letter is to alert you to the grave concerns of the State of Georgia relating to the U.S. Army Corps of Engineers' operations of the reservoirs in the Apalachicola Chattahoochee Flint (ACF) River Basin and to obtain your assistance in averting an imminent crisis.

Despite repeated warnings from State of Georgia officials, the Corps continues to operate the ACF Basin reservoirs in a manner that threatens the ability of the system to meet the most basic needs that this precious resource supports. If dry weather conditions persist, as is anticipated, unless the Corps changes its operating protocols, the reservoirs and lakes in the system will be drawn down to their lowest level in recorded history. I have enclosed correspondence to the Corps from Dr. Carol Couch, the State of Georgia's Director of Environmental Protection, explaining the factual basis of our concerns in greater detail.

The cause of the current crises was the Corps' adoption in March 2006, in response to an Endangered Species Act claim filed by the State of Florida, of an "Interim Operations" protocol pursuant to which the Corps agreed to release significantly more water than it had been from the reservoirs in the spring, when those reservoirs typically are either refilling or kept full for the purpose of augmenting flows in the dry summer months. The stated purpose of the increased flows was to protect certain threatened and endangered species in the Apalachicola River in Florida. It has now become clear to officials in the State of Georgia, through communications with Corps leadership and rank and file, that the Corps did not undertake any kind of thorough analysis of the impact of adopting the Interim Operations, particularly in a dry year like this one. Moreover, there is no scientific evidence that the flows committed by the Corps are necessary to sustain the species. To make matters worse, the Corps, rather than cutting back releases in response to the dry weather conditions, has actually released substantially more water than even the Interim Operations require.

To be blunt, one of the reasons the Corps is having difficulty managing the reservoirs is that it has no current water control plan, and as a result, is forced to make critical decisions on the operations of this complex resource "by the seat of its pants." As you know, Corps regulations require the periodic updating of the water control plans – and everyone (all the States and the Corps) agree that the updating of the water control plan is *decades* overdue. That is one of the reasons why we welcomed Secretary Woodley's commitment, in his January 30, 2006 letter, to fulfill the Corps' obligation to "update the operating procedures and manuals" for the ACF River Basin. Indeed, the Corps in adopting the Interim Operations clearly anticipated that the more exhaustive and comprehensive water control plan would quickly overtake what clearly were ill-considered "Interim" Operations. It therefore came as a total surprise and deep disappointment to learn that Secretary Woodley's decision was reversed and a decision was made to postpone the revision to the water control plans, without even consulting with the State of Georgia – the state in which all of the Corps' ACF reservoirs are located.

With lake levels and river flows falling precipitously, the State of Georgia needs your support. We are calling upon the Corps to take decisive action now to stop releases of more water than the Interim Operations require, by taking certain additional steps to mitigate the negative effects of the Interim Operations, and to reassess from the ground up the hydrologic assumptions underlying the Interim Operations. In addition, as explained in greater detail in Dr. Couch's letter, we are also calling upon the Corps and the U.S. Fish and Wildlife Service to extend the time period for the consultation regarding the Corps operations under Section 7 of the Endangered Species Act. An extension of the consultation period will allow the Corps and FWS to consider the best scientific evidence available on how the Corps can best operate the reservoir system to provide the flow regime needed by the species and to meet the other vital needs of this precious resource.

Sincerely,

Sonny Perdue

Sonny Perdue
Governor

Enclosure

cc: Mr. H. Dale Hall, Director, U.S. Fish and Wildlife Service
Mr. Sam Hamilton, Region IV Director, U.S. Fish and Wildlife Service
Ms. Gail Carmody, Ecological Services, U.S. Fish and Wildlife Service
Brigadier General Michael J. Walsh, South Atlantic Division, U.S. Army Corps of Engineers
Col. Peter Taylor, Mobile District, U.S. Army Corps of Engineers
The Honorable Saxby Chambliss, United States Senate
The Honorable Johnny Isakson, United States Senate
The Honorable Jack Kingston, United States House of Representatives
The Honorable Sanford Bishop, United States House of Representatives

The Honorable Jim Marshall, United States House of Representatives
The Honorable Cynthia McKinney, United States House of Representatives
The Honorable John Lewis, United States House of Representatives
The Honorable Tom Price, United States House of Representatives
The Honorable John Linder, United States House of Representatives
The Honorable Lynn Westmoreland, United States House of Representatives
The Honorable Charlie Norwood, United States House of Representatives
The Honorable Nathan Deal, United States House of Representatives
The Honorable Phil Gingrey, United States House of Representatives
The Honorable John Barrow, United States House of Representatives

D-24 GA-EPD letter to CESAM dated 9 June 2006

Georgia Department of Natural Resources

2 Martin Luther King Jr. Dr., S.E., Suite 1152 East , Atlanta, Georgia 30334-9000
Noel Holcomb, Commissioner
Carol A. Couch, Ph. D., Director
Environmental Protection Division
404/656-4713

June 9, 2006

Colonel Peter Taylor
Commander and District Engineer
Department of the Army
Mobile District, Corps of Engineers
190 Saint Joseph Street
Mobile, Alabama 36602-3630

Dear Col. Taylor:

The purpose of this letter is to obtain from the Corps a final decision as to whether it intends to make changes to its March 7, 2006 Interim Operations (the "IOP") to mitigate the devastating consequences of the Corps' current ACF Basin reservoir operations. This letter incorporates by references the letters and memorandums that the State of Georgia has submitted to the Corps in the past weeks on this topic, including but not limited to my May 5, 2006 letter, and attachments, and my June 1 and June 2, 2006 letters, and attachments.

Though the State of Georgia reserves the right to demand further changes to the Corps' operations, the Corps' commitment, by the close of business Monday, June 12, 2006, to make the following changes immediately will improve the situation substantially without having any measurable impact upon the threatened and endangered species in the Apalachicola River:

1. When basin inflows (BI) (as defined in the IOP) are greater than or equal to 8,000 cfs, the releases from Jim Woodruff Dam should be 8,000 cfs until all federal reservoirs on the Chattahoochee River are refilled to the top of conservation storage. In other words, the Corps should use the BI, if any, above 8,000 cfs to refill the reservoirs. As explained below, this change will have a positive impact on the mussels and their habitat.

2. When BI is less than 8,000 cfs, the Corps should release 5,000 cfs from Jim Woodruff Dam. Without this change, the Corps will be unable to sustain the 5,000 cfs floor on releases.

3. With each individual reservoir, releases should not exceed inflow for that reservoir, except when releases are necessary to augment flows to maintain 5,000 cfs.

As the State of Georgia has explained in previous communications, these changes will have a positive net impact upon the mussels and the system as a whole. Not releasing more than 8,000 cfs during this dry period will not have a negative impact upon the mussels since, as the Corps acknowledges, 8,000 cfs is the maximum known stage of the mussels on the river bed. Moreover, making these changes is the only way that the Corps will be able to meet the more critical elements of the IOP: as our modeling has demonstrated, unless the Corps increases the reservoir levels immediately by adopting these changes, there simply will not be enough water for the Corps to meet the 5,000 cfs "floor."

It is the State of Georgia's position that these changes to the IOP are mandatory in any event, but can also be accommodated within the formal consultation initiated with its March 7, 2006 letter to the U.S. Fish and Wildlife Service. As the Corps states in the IOP submitted with the March 7 letter:

> These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. *Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process.*

In addition, in the Corps' April 26, 2006 Memorandum to the Record, the Corps stated: the "Mobile District will provide by official correspondence a description of the proposed adjustments to the operating plan to be considered during the formal Section 7 consultation process. We will then decide how to describe the operation and the appropriate assumptions to be incorporated into the modeling of the Interim Operations Plan."

In addition to the foregoing specific demands, the State of Georgia would further urge the Corps to extend the Section 7 consultation process with the FWS so that the hydrologic and biological issues could be addressed thoroughly with the benefit of the best scientific information available.

Sincerely,

Carol A. Couch
Director

CAC:am

cc: Governor Sonny Perdue
Brigadier General Michael J. Walsh, South Atlantic Division, U.S. Army Corps of Enginners
Ms. Joanne Brandt, Corps of Engineers Inland Environmental Team
Ms. Gail Carmody, U. S. Fish and Wildlife Service

D-25 CESAM letter to GA-EPD dated 12 June 2006, interim response to 9 June 2006 letter

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

JUN 12 2006

REPLY TO
ATTENTION OF:

Executive Office

Dr. Carol Couch
Director
Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch,

Thank you for your letter of June 9, 2006 regarding our Interim Operations Plan (IOP) at the Jim Woodruff Dam. My staff and I have been working diligently to review the points that were raised and to determine whether they can be incorporated into the IOP. Because this is related to the ongoing litigation, the response must be coordinated within the appropriate channels. I expect that to be completed soon and should be able to provide a response before the close of business on Wednesday, June 14th.

Thank your for your assistance.

Sincerely,

Peter F. Taylor, Jr.
Colonel, Corps of Engineers
District Commander

D-26 CESAM letter to GA-EPD dated 12 June 2006, responding to GA-EPD letters dated 1 June and 2 June 2006, noting proposed adjustments to IOP and agreement to extend consultation period by 45 days

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

JUN 1 2 2006

REPLY TO
ATTENTION OF:

Executive Office

Dr. Carol Couch
Director
Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch:

Thank you for your letters of June 1 and June 2, 2006 regarding our Interim Operations Plan (IOP) at the Jim Woodruff Dam. We also share your concerns about the potential impacts of the abnormally dry conditions and the IOP on the reservoirs of the Apalachicola, Chattahoochee, Flint Rivers (ACF) system. My staff has completed a review of the model assumptions that your simulations use, as well as a review of our own modeling results. They have also performed some new simulations that separate the specific impacts of the IOP on lake levels.

First, I would like to address your concerns that the IOP could draw down Lake Lanier to levels not seen since it first was constructed in the 1950's, or, even worse, could completely deplete the storage of all of the federal reservoirs in the ACF basin. As you stated in your June 2nd letter, these concerns are primarily based on model results that included assumptions that high firm hydropower generation would occur at all of the ACF projects, beginning at a full pool level, and continuing unabated until each pool in the system is drained. As my staff explained at the modeling workshop held at Lake Seminole on May 24-25, 2006, this assumption is not valid. We currently operate our ACF projects using a "zone" operation. Under this operation, as Lake levels decline as a result of reduced inflows and demands to meet project purposes, the amount of firm hydropower that we require of each project is reduced to insure that all project purposes can be met as basin inflows and reservoir storages fall. This does not mean that hydroelectric power will not be generated at the ACF projects as lake levels decline, only that it will only be generated as required to meet other project purposes such as for Georgia water supply needs and/or downstream in-stream flow needs. If required, the Southeastern Power Administration (SEPA) would purchase replacement energy to fulfill the remaining energy amounts that the Mobile District projects could not provide. This is the process that has occurred during past historic droughts. For example, replacement energy was purchased during the 1980s and during the 1998-2002 drought periods. We have already begun discussions with SEPA regarding the possibility that purchasing replacement energy may occur this summer if drought-like conditions continue. The following table shows the high hydropower demands used in your analysis compared to the actual hydropower demands we use with a "zone" operation:

Georgia
Seasonal Daily Minimum Hours of Generation
Buford, West Point, W.F. George

Zone	Jan-June (hours use)	Jul-Oct (hours use)	Nov-Dec (hours use)
1	2	4	2
2	2	4	2
3	2	4	2
4	2	4	2

Corps of Engineers
Daily Minimum Hours of Generation – 12 months

Current Model Setting			
Zone	Buford	West Point	WF George
1	3	4	4
2	2	2	2
3	2	2	2
4	0	0	0

I have also included figure 2 of your June 2nd letter below, where your computed model results show that without imposing high firm hydropower demands on the ACF reservoirs during drier than normal and drought periods, reservoir levels will not decline precipitously, and in fact can be expected to be higher with the IOP in-place than have occurred historically on the system.

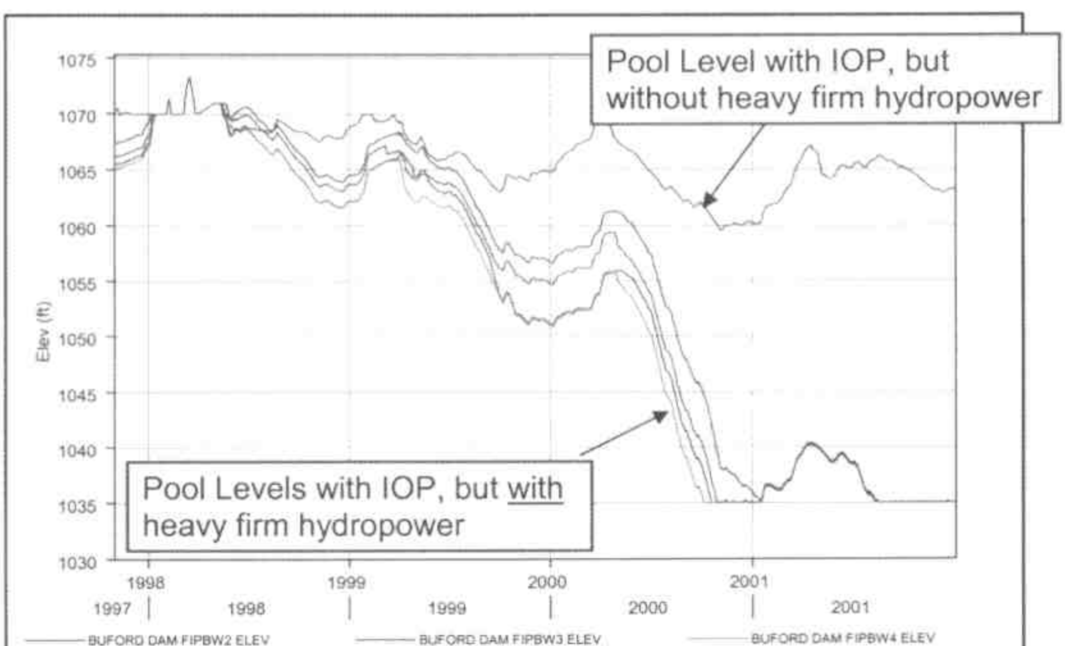


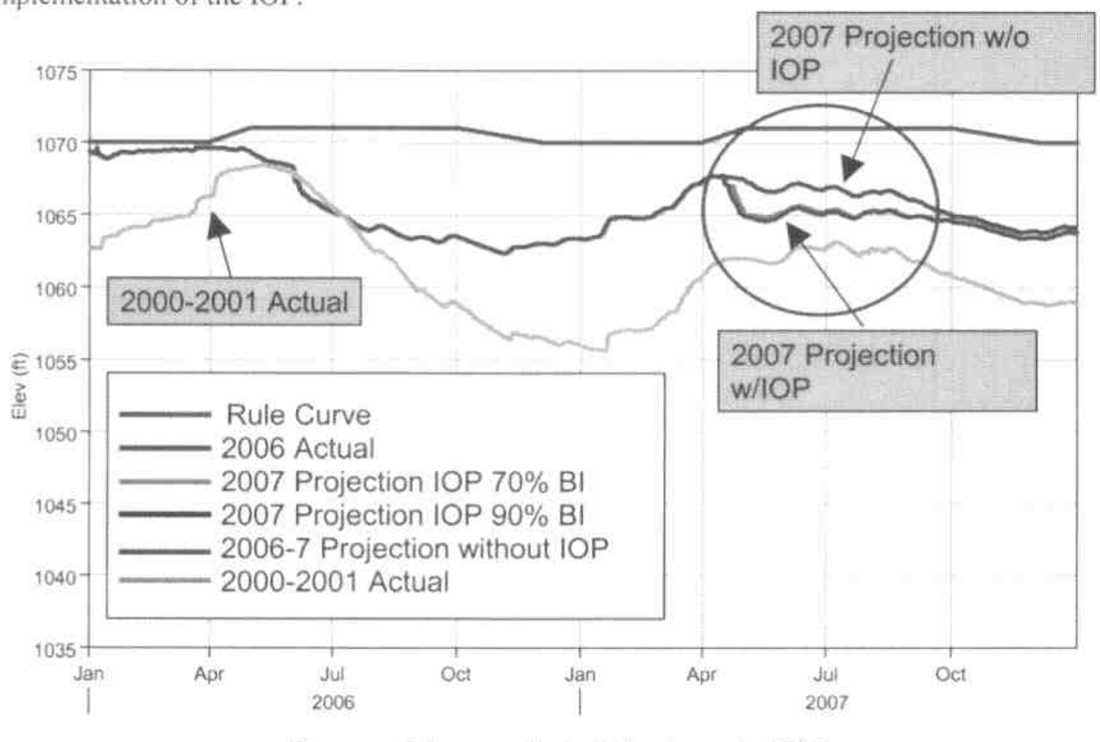
Figure 2, Georgia EPD Letter dated 2 June 2006

In addition to the inclusion of the firm hydropower demands discussed above, several other factors in the Georgia model also contribute to the lower projected pool levels in your models:

- High agricultural demands, primarily in the Flint River basin
- Passing 90% of Basin Inflow in conjunction with the IOP. The IOP allows for the Corps to pass lower releases during extended dry periods (i.e., a minimum of 70% of Basin Inflow during certain flow periods, retaining up to 30% in upstream storage reservoirs)

In order to show the impacts of the IOP without obscuring the results by inclusion of other factors, we have modeled the entire ACF system for two conditions: Implementation of the IOP and Non-Implementation of the IOP. We used the 2001-2002 flow period as the basis for these simulations.

For each of these simulations, we used the daily minimum hours of generation at each project shown in the table above labeled "Corps of Engineers, Daily Minimum Hours of Generation". Project operations for all other project purposes remain unchanged in the model. The following graph shows that when implementing the IOP during a drought year, the IOP lowered the Lanier lake levels during the spring sturgeon spawning period just under two-feet when compared to what lake levels would have been without implementation of the IOP. The model also shows that by fall of that same year, pool levels recover to nearly the same level that would have occurred without the IOP. These results are very similar to our experience this year where we entered the sturgeon spawn on March 1st with a pool level of 1069.40 at Lake Lanier, and on May 31st when we exited the spawn period, the Lake Lanier pool level was 1068.32, a decrease of only 1.08 feet. This pool level decline occurred during an abnormally dry spring. During normal to wetter hydrologic conditions, we expect that lake levels will remain constant or increase with implementation of the IOP.



Corps modeling results depicting impact of IOP

You also expressed a concern that due to the magnitude of flow requirements under the IOP, the reservoirs fail to refill for prolonged periods. In fact, since Lake Lanier has been in operation, it has not refilled on average one year out of every eight, and did not completely refill during the entire period July 1998 through February 2003. Of course, all of these draw downs occurred prior to development of the IOP. As you know, Lake Lanier has a large storage capacity, but has a relatively small drainage area. Due to the demands on project storage during extended periods of lower than normal flows, it has long been recognized that the critical period at Lake Lanier extends over a multi-year period. This multi-year critical period is normal for a project such as Lake Lanier which has a large amount of storage, a limited drainage area, and a high water demand requirement to meet its multi-purpose water resource goals.

Like you, we are concerned about the potential for releasing more water than the IOP calls for. In order to mitigate this, we have changed the way we compute basin inflows from a 3-day running average to a 7-day running average. This has smoothed the basin inflows, allowing us to more readily match basin inflow to outflow at Jim Woodruff Dam, thus minimizing or preventing over releases due to rapidly changing or fluctuating basin hydrologic conditions. Additionally, we have been continuously tracking the water volumes released to the Apalachicola River from the Jim Woodruff Dam versus the total volume of basin inflows. Based on these tracked basin inflow volumes, we have proposed to adjust our outflows to meet an overall goal of passing 100% of basin inflows when called for under the IOP. Through completion of the sturgeon spawn, our volume computations show that we only released 102.7% of basin inflow during those periods when the IOP specifies 100% of basin inflow.

As of June 9th, Lake Lanier was at elevation 1068.05 and the IOP for sturgeon spawning operations ended on May 31st. Since Lake Lanier was first filled in the 1950s, lake levels for June 9th have been lower than we are currently experiencing eight times during abnormally dry years as we are experiencing this year. This spring we have been able to meet the needs of the endangered species on the Apalachicola River, conduct successful reservoir fish spawns at all of our ACF lakes, meet hydropower demands for the region, provide reservoir storage for water supply and minimum in-stream flow needs in the Atlanta metro region, and still retain lake levels at levels high enough to support lake side recreation – all during an abnormally dry to drought year throughout the entire ACF basin.

We certainly understand that if climatic conditions remain the same or worsen, recreation and hydropower production will be affected at all projects. However, our models show there should be little impact on our ability to meet water supply, water quality, flood control and releases for fish and wildlife purposes.

We look forward to continue to working with your office to balance the water resource needs of the entire ACF basin. Thank you for your assistance.

Sincerely,

Peter F. Taylor, Jr.
Colonel, Corps of Engineers
District Commander

D-27 CESAM letter to GA-EPD dated 21 June 2006, response to 9 June letter and notice of follow-on hydrological modeling workshop

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

June 21, 2006

REPLY TO
ATTENTION OF:

Plan Formulation Team
Planning and Environmental Division

Dr. Carol Couch
Director
Georgia Department of Natural Resources
2 Martin Luther King Jr. Drive
Suite 1152 East Tower
Atlanta, Georgia 30334

Dear Dr. Couch

Thank you for your letter of June 9, 2006, regarding our Interim Operations Plan (IOP) at the Jim Woodruff Dam. As was discussed in the June 19, 2006 mediation session, like you, we want to ensure that this plan meets not only the needs of the threatened Gulf sturgeon, the endangered Fat threeridge mussel, and the threatened Purple bankclimber mussel, but also the multi-purpose water resource needs of the entire Apalachicola-Chattahoochee-Flint River basin.

While operating under the IOP this spring we have identified several "lessons learned" and have asked the U.S. Fish and Wildlife Service (USFWS) to evaluate proposed adjustments to the IOP that could minimize unintended impacts on project operations and improve our ability to manage releases from Jim Woodruff Dam to meet the needs of the Federally listed species as well as our authorized purposes. These proposed adjustments include the method for computing basin inflows to manage releases under the IOP (using a seven-day average basin inflow rather than a three-day average); tying computations of basin inflows and releases to the Chattahoochee gage; clarifying threshold flows for ramping rates associated with flood control operations; clarifying how releases for gradual ramping rates are captured in the volumetric computation of releases to meet the volumetric computation of basin inflows; and a lowering of the upper flow threshold for the months of June through February which would allow for additional storage under certain conditions. In addition to inquiring about changes we have made to the IOP, you also suggested several specific changes be made to the IOP. Under separate cover, we have provided all three States the IOP, the Revised IOP, and all of the modeling data. We are scheduling another workshop to explain the IOP and how we modeled it. A notice will be coming to you in the near future with the time, date, and location. We will take your current comments and any future comments into consideration in deciding upon any other revisions.

Your letters also asked that we extend the Section 7 consultation period with the USFWS so that additional scientific information can be considered in the development of the Biological Opinion. On June 13, 2006, the USFWS requested a 45-day extension of the consultation period. We have reviewed their request and agree that it is appropriate to extend the consultation period for an additional 45 days. We will respond to the Service by letter and then inform the Court of this development.

We recognize that the amount of storage committed to hydropower generation is the variable that most affects projected reservoir levels. As my June 12, 2006 letter explained, we operate our projects using a zone concept. Under this concept, we reduce the amount of hydropower we require of each project as lake levels decline. This was the nature of project operations during the 1998-2002 drought. This does not mean that we do not generate hydropower at ACF projects as lake levels decline, but rather that hydropower is generated to the extent practicable to satisfy multiple project purposes (water quality, water supply, releases for fish and wildlife). If the resulting generation is insufficient to satisfy the demand for hydroelectric energy, the Southeastern Power Administration (SEPA) may purchase replacement energy to fulfill the remaining energy amounts that Corps projects in the region could not provide. Should the current drought-like conditions continue into the summer, we would envision operating under this same methodology for all our projects on the ACF. However, as always, we may need to make adjustments to respond to operational issues.

I appreciate your input as we refine the IOP, not only to meet the needs of the endangered species, but continuing to insure that we balance the completing water resource needs of the entire ACF basin.

Thank your for your assistance.

fr Powell LTC, EN

Peter F. Taylor
Colonel, Corps of Engineers
District Commander

Copies Furnished:

Mr. Trey Glenn
Director, Alabama Department of
Environmental Management
Post Office Box 301463,
Montgomery, AL 36130-1463

Ms. Colleen M. Castille
Secretary, Florida Department of Environmental Protection.
Majory Stoneman Douglas Building
3900 Commonwealth Boulevard
Tallahassee, Florida 32399

D-28 GA-EPD letter to CESAM and USFWS dated 28 August 2006, forwarding Memorandum from Dr. Douglas Peterson, University of Georgia

~~C-PD~~ ~~KIB~~
PD-EI

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

August 28, 2006

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

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

Dear Colonel Taylor and Ms. Carmody:

Enclosed is a memorandum by Dr. Douglas L. Peterson discussing the data on 2005 and 2006 Gulf sturgeon spawning activity in the Apalachicola River and assessing the assumptions underlying the Corps of Engineers' Interim Operations for Jim Woodruff Dam. Dr. Peterson is a professor at the University of Georgia's Warnell School of Forestry and Natural Resources whose area of emphasis is North American sturgeon species. His CV accompanies the memorandum. I ask that you review Dr. Peterson's memorandum carefully and take it into consideration in the pending Section 7 consultation concerning the Corps' reservoir operations in the ACF Basin and in the Corps' further refinement of those operations.

Sincerely,

Carol A. Couch

Carol A. Couch
Director

CAC:ypf

cc: Curtis M. Flakes, Chief, Planning and Environmental Division, U.S. Army Corps of Engineers
Colleen Castille, Florida Dept. of Environmental Quality
Trey Glenn, Alabama Dept. of Environmental Management

MEMORANDUM

TO: Dr. Carol A. Couch, Director, Georgia EPD
FROM: Dr. Douglas L. Peterson
DATE: August 28, 2006
RE: Review of Gulf Sturgeon Spawning Data and IOP

I have reviewed the data and assumptions that the United States Army Corps of Engineers and the United States Fish and Wildlife Service are using to develop and assess the amended Interim Operations Plan (IOP) for Jim Woodruff Dam. In particular, I have studied the 2005 and 2006 egg collection data for the Gulf sturgeon in the Apalachicola River, including the August 2006 report of Pine, et al. entitled, "An Assessment of Gulf Sturgeon Movement, Spawning Site Selection, and Post-Spawn Holding Areas in the Apalachicola River, Florida," and other available information concerning the Gulf sturgeon population in the Apalachicola Bay. I write this memorandum to offer my observations and conclusions.

I conclude that (a) there are currently no data supporting a relationship between any particular flow in the Apalachicola River and spawning success in the River, (b) there is no scientific evidence that the flows that the Corps maintained during the spawning season in recent droughts (such as that of 1998-2001) have contributed to the Gulf sturgeon's decline or interfered with the Gulf sturgeon's recovery, (c) there is no scientific evidence that the flows provided under the IOP are necessary for Gulf sturgeon to spawn successfully, (d) if the Corps used the 2006 egg collection data and applied its rationale for the IOP flow thresholds, those thresholds likely would have been set much lower than they were, and (e) the flows provided during the spawning season under the IOP are probably unnecessarily high and could be harmful to Gulf sturgeon spawning.

I. <u>The Pine Report</u>

A. <u>Objectives</u>

In spring 2006, researchers from the University of Florida conducted a field study of adult Gulf sturgeon in the Apalachicola River, Florida. The objectives of this study were to:

1. Identify active spawning sites of Gulf sturgeon below Jim Woodruff Lock and Dam (JWLD) and describe environmental conditions at spawning.

2. Describe seasonal movements of spawning Gulf sturgeon.

3. Assess population size of Gulf sturgeon in the tributary waters of the Brothers River.

B. Methods

Pine et al. employed the following methods:

1. Telemetry of tagged adults to describe seasonal habitat use and subsequently to locate likely spawning habitats of adult Gulf sturgeon.

2. Use of artificial egg-mat sampling devices to passively collect drifting eggs as a qualitative verification of approximately where and when a spawning event had occurred. The mats were deployed non-randomly and with varying levels of effort at specific sites where spawning was suspected based on previous habitat surveys and movements of telemetered fish.

3. Use of simple mark-recapture methods to estimate numbers of Gulf sturgeon in the Brothers River tributary.

C. Results

The key findings in this study that are most relevant to ongoing discussions regarding the newly proposed IOP for JWLD are as follows:

1. Researchers were able to verify Gulf sturgeon spawning activity at 2 discrete sites located below JWLD. However, detection probabilities were low[1] (<10%) and varied depending of environmental conditions suggesting that spawning probably occurred at other sites as well.

2. Spawning was documented between April 3 – May 1, although specific spawning dates can not be determined because egg mats were only checked every 48-72 hours and detection probabilities were low (<10 %).

3. Spawning was documented on 12 specific 2-3 day periods at water temperatures of 20-25° C, and discharge of 12,700 – 22,400 cfs. Mean discharge during these sampling periods was 15,836 cfs (SD = 2655).

4. Determination of an optimal flow regime for Gulf sturgeon spawning in the Apalachicola will require at least 5-10 consecutive years of intensive study.

D. Discussion of Pine Study and Report

In general, I believe this study was well conceived and executed. The researchers have provided an excellent "first-step" in understanding seasonal habitat use of Gulf sturgeon in the Apalachicola River. The portion of this study that is most relevant to ongoing

[1] Using the egg collection data from this study listed in Appendix B, I used McKenzie's occupancy model to evaluate the likelihood that researchers could detect individual spawning events given the limitations of their sampling gear and experimental design. This analysis revealed that the researchers were only able to detect 2-10% of the total spawning events that occurred in 2006.

discussions regarding water management policies in the Apalachicola River focuses on the collection of Gulf sturgeon eggs using artificial spawning mats (aka egg-samplers):

DATE	Discharge (cfs)	Eggs collected	Trend in Flow (2 day mean)	Trend in Flow (3 day mean)	Mean Discharge (2 days)	Mean Discharge (3 days)
4/3/2006	16100	0	-1800	-1600	17000	17766.67
4/4/2006	15300	*	-800	-1300	15700	16433.33
4/5/2006	15200	18	-100	-450	15250	15533.33
4/6/2006	16000	*	800	350	15600	15500
4/7/2006	17100	43	1100	950	16550	16100
4/8/2006	16700	*	-400	350	16900	16600
4/9/2006	15800	*	-900	-650	16250	16533.33
4/10/2006	16000	3	200	-350	15900	16166.67
4/11/2006	18500	*	2500	1350	17250	16766.67
4/12/2006	22400	33	3900	3200	20450	18966.67
4/13/2006	21100	*	-1300	1300	21750	20666.67
4/14/2006	19600	22	-1500	-1400	20350	21033.33
4/15/2006	18000	*	-1600	-1550	18800	19566.67
4/16/2006	16700	*	-1300	-1450	17350	18100
4/17/2006	15200	5	-1500	-1400	15950	16633.33
4/18/2006	13800	*	-1400	-1450	14500	15233.33
4/19/2006	12700	1	-1100	-1250	13250	13900
4/20/2006	12600	*	-100	-600	12650	13033.33
4/21/2006	13100	2	500	200	12850	12800
4/22/2006	13100	*	0	250	13100	12933.33
4/23/2006	13100	*	0	0	13100	13100
4/24/2006	13300	1	200	100	13200	13166.67
4/25/2006	13300	*	0	100	13300	13233.33
4/26/2006	14100	3	800	400	13700	13566.67
4/27/2006	15800	*	1700	1250	14950	14400
4/28/2006	17700	40	1900	1800	16750	15866.67

* Egg mats were left fishing but were not checked. Negative values indicate declining flows while positive values indicate increasing flows.

For the most part the authors are careful to limit their interpretations of the egg collection data, stating that these data simply provide verification of spawning activity at specific locations (within 100 m) and dates (within 2-3 days). The authors also use these data to provide a description of the prevailing environmental conditions (temperature and flow) during the spawning season (April). Any inferences about cause-effect relationships based on these descriptions (e.g., sturgeon can only spawn under certain flow conditions, or sturgeon lay more eggs under certain flows), however, would constitute a gross misinterpretation of the data. The authors' analyses and conclusions from this portion of the study are carefully worded to avoid this mistake, with one notable exception. On page 18, paragraph 3, the authors' write:

"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 the JWLD on April 6, 11, and 27-28."

In this study, egg-samplers were fished continuously for 2-3 days before they were checked. Hence, the authors do not actually know the days on which spawning occurred. While it is true that flow had been increasing in the days immediately prior to several (but not all) of these sampling events, discharge was actually declining when the gear was fished (not checked) on 5 of the 11 sampling periods when a spawning event was detected. Moreover, the number and distribution of egg samplers deployed was highly variable and non-random, precluding any type of quantitative evaluation of spawning activity.[2] Although the researchers did not evaluate gear efficiency, my analysis of their data from Appendix B, revealed that the detection probabilities in this study were very low (2-10%) and varied depending on flow and other unidentified variables. Furthermore, to obtain a quantifiable estimate of Gulf sturgeon reproduction would require use larval nets that measure the number of larvae produced per cubic meter of water sampled. Hence, any interpretive statement based on the <u>number</u> of eggs collected in any particular location (or locations) is completely unsupportable and should be removed from this report or disregarded. The methodology is <u>not</u> suitable, nor was it intended for, an assessment of the degree of spawning success.

II. <u>Management Implications of 2005 and 2006 Spawning Data</u>

A. <u>IOP Rules During Gulf Sturgeon Spawn</u>

The Corps' IOP prescribes the following operating rules for JWLD during the months of March through May: (1) when Basin Inflows are greater than or equal to 37,400 cfs, the Corps will release no less than 37,400 cfs from JWLD; (2) when Basin Inflows are between 20,400 cfs and 37,400 cfs, the Corps will release between 70% and 90% of Basin Inflows, but not less than 20,400 cfs; and (3) when Basin Inflows are less than 20,400 cfs, the Corps will release 100% of Basin inflows, and in no event will release less than 5,000 cfs.

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[2] Egg mats were not deployed in any standardized fashion, but rather they were placed in close proximity to radio-tagged fish at sites where spawning was suspected. Although this non-random design is acceptable for simple verification of spawning in certain areas, it can not be used to quantify the number of eggs spawned. Female Gulf sturgeon produce hundreds of thousands of eggs that are rapidly dispersed over large areas by prevailing water currents. The number of eggs collected on a particular egg mat is largely dependent on the relative position of the mat in relation to spawning fish and the variable dispersal pattern of eggs after they are released. Quantitative evaluation of the number eggs spawned requires a highly standardized sampling design based on constant effort that is randomly distributed over the entire sampling area for the entire duration of the spawning season. Sampling efficiency of the gear must also be evaluated through time and space to determine, in vivo, how changes in environmental conditions affect the settling rate of sturgeon eggs on the spawning mats.

According to the Corps and the U.S. Fish and Wildlife Service (USFWS) the IOP is intended to:

1. Provide year-round operations to support flow needs for Gulf sturgeon spawning, young sturgeon, mussels, and host fish for mussels.
2. Minimize or avoid impacts of low flow operations on listed species or critical habitat.
3. Provide for storage when water is more plentiful to allow for future augmentation during low flows in support of mussels.
4. Minimize conflicts with management for other fish and wildlife species (e.g., reservoir fish management).
5. Minimize impact to other project purposes.

B. Lack of Data Connecting Spawning Success with Flows

The goal of the IOP to support the needs of the Gulf sturgeon certainly is worthy, but the there is no scientific basis for the flows that the IOP prescribes. The Gulf sturgeon population of the Apalachicola System has been reduced to the point of requiring federal protection, at least in part because of previous fishing practices that decimated the population. Since all harvest was banned in 1984, the best available data suggest that the population has been slowly but steadily increasing (see Pine et al. 2001, and Pine and Allen 2006).

Neither the Pine Report nor any other available data indicate what flows are needed for successful Gulf sturgeon reproduction in the Apalachicola River, or any other Gulf sturgeon river for that matter. Although empirical evidence is lacking, most sturgeon researchers believe that optimal spawning conditions for Gulf sturgeon result from a combination of *several* environmental conditions – not just flow (see Cech and Doroshov 2004). These factors <u>probably</u> include flow, temperature, presence of suitable substrate, photoperiod, and perhaps more importantly, how well these conditions are synchronized (in both time and space) with the maturation cycles of female sturgeons. However, some studies suggest that *rates of change* in both temperature and flow may actually be more important than the actual conditions at spawning. In other words, female sturgeons may be capable of integrating several dynamic environmental cues over many weeks, or perhaps months, leading up to spawning. While it is true that some studies show that females may abort spawning if environmental conditions are not favorable, it is also true that the act of producing viable fertilized eggs does not guarantee a "successful spawn".

At present, there are no published studies that actually evaluate Gulf sturgeon spawning success. As noted above, the Pine Report documents *whether* Gulf sturgeon spawned in certain general locations and times, but it does not document how successful the spawn was, much less whether the spawn was affected by any particular stream flow. The methodology that Pine and others have used to document Gulf sturgeon spawning is not appropriate for quantification of spawning success, let alone determination of cause-effect relationships regarding optimal spawning conditions. More specifically, there are no data in this, or any other study, that support the assertion that river flows must be maintained at levels as high as those prescribed in the IOP for successful Gulf sturgeon spawning. In fact, the Pine Report specifically addresses this lack of data on page 18, paragraph 2:

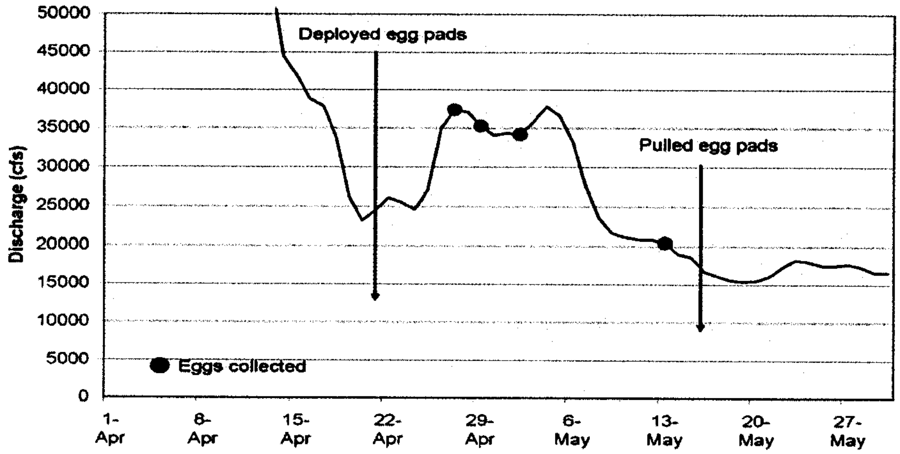
"The interactions between riverine flow dynamics, sturgeon life history attributes, dam operations, and the immediate needs of resource managers to make water policy decisions are quite complicated in the Apalachicola River Basin. Given these difficulties, what can be done to provide policy makers with the information to make more informed decisions? This study is based on observations taken from a single year and flow season. To begin to understand the relationships between Apalachicola River flow regulations, Gulf sturgeon spawning, and ultimate successful Gulf sturgeon recruitment to adult size, a long-term commitment to research is required by all State and Federal agencies."

The authors go on to say that additional studies, over at least a 5-10 year period, are needed before a responsible flow management program can be identified. Given the results of this study and the interpretations of its authors, I believe that altering the Corps' historical reservoir operations as prescribed in the IOP is premature, irresponsible, and potentially dangerous to the Gulf sturgeon population below JWLD.

C. Flaws in the Stated Biological Rationale for the IOP's Requirements during Gulf Sturgeon Spawn

At a July 2005 workshop in Columbus, Georgia, the Corps and USFWS cited an unpublished USFWS study of 2005 Gulf sturgeon egg collection data as the best available data concerning the flow conditions in which Gulf sturgeon spawn in the Apalachicola River. The following are results of that study:

- Sampling in 2005 collected sturgeon eggs on a single rock ledge located at NM (nautical mile) 105 at flows between 37,400 cfs and 20,400 cfs.
- 20 Gulf sturgeon eggs were collected at depths ranging from 7.5 ft to 20.1 ft. from 17 samples on 4 dates.
- The rock ledge at NM 105 was completely inundated to depth of 4.5 ft. at flows of 30,000 cfs.
- At flows of 20,400 cfs approximately 75% of the rock ledge was inundated to depth of 4.5 ft.
- At flows of less than 16,000, the rock ledge at NM 105 becomes completely dewatered.
- Spawning habitat and adequate flow regime are primary constituent elements of critical habitat.



USFWS 2005 Study Data

According to the Corps and USFWS, the IOP's requirements during the Gulf sturgeon spring spawning months of March-May are premised on the following assumptions:

1. The Gulf sturgeon population below JWLD is currently limited by availability of suitable spawning habitat.

2. The collection of fertilized eggs on spawning mats is a measure of successful spawning.

3. The limestone outcropping located at NM 105 is currently the most important spawning site below JWLD.

4. A flow of at least 20,400 cfs is needed before sturgeons can effectively use this site for spawning (75% inundation to a depth of 4.5ft). Hence, the Gulf sturgeon reproduction will be impaired at flows less than 20,400 cfs.

5. Flows above 20,400 cfs and up to 37,400 cfs are beneficial for Gulf sturgeon spawning.

The following is my analysis of the above assumptions:

Assumption 1: Although construction of dams on spawning tributaries has unquestionably impeded recovery of many sturgeon populations worldwide, there is yet no evidence that the Gulf sturgeon population of the Apalachicola River is limited by availability of suitable spawning habitat. In fact, given the low numbers of adults estimated in this population, this assumption is probably false. The "best available data," show that overfishing was probably a major factor in the decline of Apalachicola Gulf sturgeon and that the population has actually been increasing since it was protected in 1984. Given that the intrinsic population growth rate of many sturgeons (including Gulf sturgeon) is known to be very low because of their unique life history strategy (slow growth, late maturity, protracted spawning periodicity), the slow growth rate of the Apalachicola population may by typical of this species even under pristine conditions.

Assumptions 2-5: First, the egg collection methods used in both the 2005 and 2006 studies are scientifically inappropriate for making any determination of spawning success. The methodology is only appropriate for "confirmation" of spawning at general locations and times. Under no circumstances should the data collected with these methods be used to evaluate potential relationships between spawning success and specific flow conditions, especially given the variable and non-random sampling design used in these studies. To justify proposed changes in flow requirements below JWLD with the argument that these data are the "best available" is equally inappropriate.

Second, data from this past spring (2006) illustrate the falsity of the assumptions that limestone outcropping located at NM 105 is the only important spawning site below JWLD, or that a flow 20,400 cfs is necessary for spawning to occur in the Apalachicola River. In 2006, eggs were collected at several other sites and at much lower flows than those measured during the 2005 spawning season. In 2005, FWS biologists detected Gulf sturgeon spawning events on only 4 of 17 sampling periods at flows of 20,400 - 37,400 cfs. In 2006, however, Pine et al. used the same methods and detected spawning events on 11 of 26 sampling periods at flows of 12,700 – 22,400 cfs (mean = 15,836 cfs, SD = 2655 cfs). Clearly, the results of 2006 study show that the specific flow standards specified in the IOP are not scientifically justified. Furthermore, it should be noted that excessively high flows could even impair Gulf sturgeon reproduction by scouring eggs from exposed substrates and by reducing water available for flow augmentation that may be needed at other times of the year or in successive years of prolonged drought.

III. Conclusions

There are no data indicating that the Corps' operations in recent years, during the Gulf sturgeon spawning months of March-May in particular, have negatively affected Gulf sturgeon spawning. In fact, recent population studies have shown that the Gulf sturgeon population in the Apalachicola River appears to be increasing, suggesting that the Corps' operations have not significantly harmed this population. In any event, the best available data do not support the assumption that flows of or in excess of 20,400 cfs in the Apalachicola River are necessary for a successful Gulf sturgeon spawn. Indeed, the assumptions underlying the IOP would appear to suggest that had the 2006 spawning data been available at the time the Corps and USFWS developed the IOP, they would have recommended much lower flows to support sturgeon spawning.

If flow management policy below JWLD is to be changed in an effort to help speed recovery of the this population, we ought to first have meaningful quantified data that identify flow regime as a key limiting factor for this particular population. Without such data, changes in flow management from the Corps' historical operations will have unpredictable and potentially negative consequences for Gulf sturgeon. Given the lack of peer-reviewed scientific evidence relating flow and reproductive success of Gulf sturgeon, I agree with the conclusions of Pine et al. (2006) that a long-term study is needed to identify and quantify the environmental variables that influence successful reproduction in this population. Pending the outcome of such a study, changes in flow management policy are not scientifically sound and as such, are unnecessarily risky.

Curriculum Vitae

Dr. Douglas L. Peterson Jr.
email: dpeterson@forestry.uga.edu
phone: (706) 542-2944

EDUCATION

Jul 1993 to Jan 1997	The Pennsylvania State University State College, PA Ph.D. in Fisheries Science, 1/19/1997
Apr 1991 to Jun 1993	Michigan State University East Lansing, MI M.S. in Fisheries Science, 5/1993
Feb 1984 to May 1988	Oberlin College Oberlin, OH B.S. in Biology, 5/1988

PROFESSIONAL EXPERIENCE

Aug. 2001 to Present — **Assistant Professor – 12-MonthTenure Track**
Warnell School of Forest Resources, University of Georgia, Athens, Georgia 30602

Research Summary

Currently directing research on 5 funded projects including lake sturgeon reintroduction in Georgia, feasibility of sturgeon aquaculture, population dynamics of shortnose sturgeon, and critical habitat of Atlantic sturgeon. Eight grants awarded to date over the past 4 years totaling approximately, $950,000.

Aug. 1998 to Aug 2001 — **Assistant Professor – 9-MonthTenure Track**
Dept. of Biology, Central Michigan University, Mt. Pleasant Michigan 48859

Research Summary

Wrote more than 12 extramural grants while teaching 6 courses per year (18 hours) to build new research opportunities at CMU in the field of fisheries science. Awarded 7 grants totaling $484,020 in research funds. Projects included studies of life history and population dynamics of lake sturgeon and smallmouth bass.

Feb 1997 to August 1998 **Post-Doctoral Research Associate – NY Coop Fish & Wildlife Research Unit 208 Fernow Hall - Cornell University, Ithaca NY 14853**
Supervisor: Dr. Mark Bain

Research Summary

Supervised last 2-years of a 3-year study on the population dynamics of the endangered shortnose sturgeon in the Hudson River.

Supervised 2 year study to assess recruitment of juvenile Atlantic sturgeon using a mark-recapture population estimate of 1995 cohort

Designed and supervised a river-wide creel survey to assess the recreational striped bass fishery on the Hudson River using a modified aerial-access design

Designed and supervised research on ecology and habitat distribution of juvenile Atlantic sturgeon in the Hudson River using several fisheries research methods including gill netting, trawling, and sonic telemetry

Supervised a cooperative research effort with New York Department of Environmental Conservation to assess the spawning population and effects of commercial harvest on stocks of American shad in the Hudson River

Jul 1993 to Feb 1997 **Graduate Research Asst. – Pennsylvania Cooperative Fish & Wildlife Research Unit 113 Merkle Lab – Penn State University, University Park, PA 16801**
Supervisor: Dr. Robert Carline

Research Summary

Designed and conducted research on zooplankton and larval fish with emphasis on how community structure and abundance of zooplankton influence critical period mortality of larval walleyes

Designed and coordinated statewide field experiments with the Pennsylvania Fish and Boat Commission to evaluate current methods of marking and handling larval walleyes prior to stocking

Designed and conducted experiments testing new techniques for the intensive culture of walleye fry and fingerlings. New methods developed in this research are now in routine use at several PA state fish hatcheries

Apr 1992 to Jun 1993 **Graduate Research Asst. – Dept. of Fisheries & Wildlife, Michigan State University 13 Natural Resources Bldg. – East Lansing MI 48864**
Supervisor: Dr. Niles Kevern

Duties and Accomplishments

Designed and conducted a two-year study to examine how introduction of the exotic cladoceran, Bythotrephes cederstroemi, may affect production of several important Lake Michigan gamefish, including yellow perch, alewife, and several species of salmonids

Conducted a 2 year study of yellow perch diets in the nearshore waters of Lake Michigan to determine how ecological interactions with alewife and other forage species may affect production

COURSES TAUGHT – UGA

FORS 5360/7360 - Fisheries Management w/Lab (4)
FORS 1100 – Conservation of Natural Resources (3)
FORS 8300 - Seminar: Contemporary Issues in Fisheries Research (1)
FORS 9000 - Ichthyology (4)
FORS 4360/6360 – Fish Ecology (3)
STUDY ABROAD - Biology and Management of Salmon in the Pacific Northwest (3)

COURSES TAUGHT – Prior to appointment at UGA

Fisheries Management (4)
Fisheries Biology (3)
Advanced Fisheries Techniques (3)
Ichthyology (4)
Fisheries Conservation (1)
Scientific Writing (2)

PROFESSIONAL ACTIVITIES

American Fisheries Society - Editor of the Northeast Division Newsletter, 1996
PA Chapter AFS - Executive Committee Member, 1996
Manuscript reviewer: Transactions of the American Fisheries Society
Manuscript reviewer: North American Journal of Fisheries Management
National Marine Fisheries Service: Endangered Species Permit Review
Grant Proposal reviewer: Long Island Sea Grant Institute
Associate Editor: North American Journal of Fisheries Management

SELECTED PUBLICATIONS

Peterson, D.L., Peterson J., R. F. Carline. 2006. Effects of Zooplankton Abundance On Survival of Stocked Walleye Fry in Five Pennsylvania Reservoirs. Journal of Freshwater Ecology 21:121-129

Vecsei, P. and D. L. Peterson. 2006. Threatened Fishes of the World: *Acipenser stellatus* (Acipenseridae). Environmental Biology of Fishes [in press]

Vecsei, P. and D. L. Peterson. 2006. Threatened Fishes of the World: *Acipenser ruthenus* (Acipenseridae). Environmental Biology of Fishes [In Press]

Wirgin, I., Grunwald, C., Carlson, E., Stabile J., Peterson, D.L., and Waldman, J.R. 2004. Range-wide population structure of shortnose sturgeon *Acipenser brevirostrum* based on sequence analysis of the mitochondrial DNA control region. Estuaries 28:406:421

Vecsei, P. J. and D. L. Peterson. 2003. Sturgeon Ecomorphology: a descriptive approach. In: Sturgeons and Paddlefish of North America. (Eds) S. McKinley, W.B.H Beamish, and G.S. Lebreton. Kluwer Academic Press. In press

Peterson, Douglas L., P. Vecsei, and D. L. G. Noakes. 2003. Threatened Fishes of the World: Acipenser fulvescens Rafinesque, 1817 (Acipenseridae). Environmental Biology of Fishes.

Vecsei, P. and D. L. Peterson. 2002. Threatened Fishes of the World: *Huso Huso* (Linnaeus,1758) (Acipenseridae). Environmental Biology of Fishes **65** (3): 363-365

Vecsei, P. and D. L. Peterson. 2002. Threatened Fishes of the World: Acipenser nudiventris Lovetsky, 1828 (Acipenseridae). Environmental Biology of Fishes **65**(3): 363-365

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Caswell, Nathan, D. Peterson, B. Manny, and G. Kennedy. 2002. Spawning by lake sturgeon (Acipenser fulvescens) in the Detroit River. Journal of Applied Ichthyology 20(1) 1-6.

Bain, M. B., N. Haley, D. Peterson, J. Waldman, and K. Arend. 2000. Harvest and habitats of Atlantic sturgeon (Acipenser oxyrinchus) in the Hudson River estuary: lessons for sturgeon conservation. Boletin Instituto Español de Oceanografía, Madrid, Spain. 16(1-4) 43-53

Vecsei, P. and D. L. Peterson. 2000 Threatened Fishes of the World: *Acipenser oxyrinchus* Mitchill, 1815 (Acipenseridae). Environmental Biology of Fishes.

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Peterson, Douglas L., Nancy Haley, and M. B. Bain. 2000. Evidence of declining recruitment of Atlantic sturgeon in the Hudson River. North American Journal of Fisheries Management. 20:231-238.

Peterson, Douglas L. and R. F. Carline, 1996. Effects of tetracycline marking, transport time, and transport density on the short-term survival of walleye fry. The Progressive Fish-Culturist 58:29-31

Peterson, Douglas L., R. F. Carline, T. Wilson, and M. Hendricks. 1997. Production-scale methods for the intensive culture of walleye fry. The Progressive Fish-Culturist 59:11-17

RECENT PRESENTATIONS (invited*)

DeVries, Robert, and D.L. Peterson. 2005. Status of shortnose sturgeon in the Altamaha River, GA. Georgia. Georgia Chapter of the American Fisheries Society. G.T. Bagby State Park. **BEST PAPER**

Peterson, D.L. and J. Kornberg. 2005. Advances in culture methods of juvenile lake sturgeon, *Acipenser fulvescens*, using natural and artificial diets. Georgia Chapter of the American Fisheries Society. G.T. Bagby State Park.

Peterson, D.L. and J. Kornberg. 2005. Sturgeon Research in Georgia: a summary of current research and future needs. Endangered species meeting of the GDNR, Social Circle, GA.

Kornberg, Joel, and D.L. Peterson. 2005. Advances in culture methods of juvenile lake sturgeon, *Acipenser fulvescens*, using natural and artificial diets. Annual Meeting of the Tennessee Aquarium Lake Sturgeon Recovery Team. Chattanooga, TN.

*Vecsei, Paul J., and D. L. Peterson. 2005. Biology, management, and status of lake sturgeon in the Great Lakes. Canadian Conference of Fish & Fisheries Research. Windsor, Canada.

Vecsei, Paul J. and D.L. Peterson. 2005. Lake Sturgeon of the Muskegon River: population dynamics and life history. 66th Meeting of the North Central Division of the American Fisheries Society.

Bezold, J. and D.L. Peterson. 2005. Post-Stocking Assessement of Lake Sturgeon in the Coosa River, GA. Annual Project Review for GDNR, Northwest Region. Calhoun, GA.

Kornberg, Joel, and D.L. Peterson. 2005. Advances in culture methods of juvenile lake sturgeon, *Acipenser fulvescens*, using natural and artificial diets. Annual Project Review for GDNR, Northwest Region. Calhoun, GA.

DeVries, Robert, and D.L. Peterson. 2005. Status of shortnose sturgeon in the Altamaha River, GA. WSFR Graduate Student Symposim. Athens, GA

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Vecsei, Paul J., and D. L. Peterson. 2004. Lake sturgeon of the Muskegon River: population dynamics and life history. Annual Meeting of the American Fisheries Society. Madison, WI.

DeVries, Robert, D. Higginbotham, and D.L. Peterson. 2004. Status and life history of the shortnose sturgeon in the Altamaha River, Georgia. Annual Meeting of the American Fisheries Society. Madison, WI.

Marion, Kathy, and D.L. Peterson. 2004. Restoration of lake sturgeon in the Coosa River, GA. Annual Meeting of the American Fisheries Society. Madison, WI.

Kornberg, Joel, and D.L. Peterson. 2004. New methods for intensive culture of lake sturgeon using natural and artificial diets. Annual Meeting of the American Fisheries Society. Madison, WI.

*Peterson, Douglas, L. 2004. Assessment of Fisheries Reintroductions. Annual meeting of the GDNR Fisheries Division. Lake Blackshear, GA.

*Peterson, Douglas, L. 2004. Shortnose sturgeon of the Altamaha River. Meeting of the National Marine Fisheries Service. Washington, D.C

*Peterson, Douglas, L. 2004. Methods of Sampling Shortnose Sturgeon in Coastal Rivers. Meeting of the National Marine Fisheries Service. Washington, D.C.

Vecsei, P.J., and Peterson. 2004. Population Dynamics & Life History of Lake Sturgeon in the Muskegon River, Michigan: Primary Steps Towards Rehabilitation of a Remnant Stock. Spring Meeting of the Southern Division of the American Fisheries Society. Oklahoma City, Ok.

Seider, Michael, and D. L. Peterson. 2003. Population dynamics of smallmouth bass in The Beaver Islands, Michigan. Georgia Chapter of the American Fisheries Society. Barry College, Georgia. (runner-up for best paper)

Peterson, Douglas L. and Mark Bain. 2002. Sturgeon of the Hudson River: current status and recent trends of Atlantic & shortnose sturgeon. The 132nd American Fishery Society Annual Meeting – Baltimore, Maryland.

Peterson, Douglas L. and B. Gunderman. 2001.Population Dynamics of lake sturgeon in the Mansitee River. The 4th International Sturgeon Symposium, Oshkosh, Wi.

Caswell, Nathan and D.L. Peterson. 2001. Lake Sturgeon spawning in the Detroit River. The 4th International Sturgeon Symposium, Oshkosh, Wi.

Smith, Kregg, and D.L Peterson. 2001. Recruitment dynamics of lake sturgeon in Black Lake, Michigan. The 4th International Sturgeon Symposium, Oshkosh, Wi.

FUNDED GRANT PROPOSALS (Since fall, 2001) - UGA

- Peterson, D. L. 2006. Population dynamics, Critical Habitats, and Factors affecting Abundance of Atlantic Sturgeon in the Altamaha River. National Marine Fisheries Service. $276,000, 3 yrs beginning 06/2006.

- Peterson, D. L. 2006. Population Dynamics and Essential Habitats of Shortnose Sturgeon in the Ogeechee River, GA. National Marine Fisheries Service. $225,900, 3 yrs beginning 06/2006.

- Nibblink, N. and D.L. Peterson. 2006. A risk assessment for tilapia culture in Georgia: Potential impacts on sport fisheries. GDNR $53,500. Two-year study beginning 05/06.

- Peterson, D. L. 2004. Status Assessment of Remnant Lake Sturgeon Populations in the Lake Michigan Basin – Muskegon River Subproject. Great Lakes Fishery Trust: $46,700. Tow-year study funded for 2004-2006.

- Peterson, D.L. 2004. Intensive Culture of Walleye Fingerlings in Georgia. Faculty Research Grant, UGA. $4,525, for 1-year pilot study.

- Peterson, D. L. 2003. Population Dynamics and Essential Habitats of Atlantic Sturgeon in the Altamaha River. GDNR $200,478 for 2-year study in 2004-2005.

- Peterson, D. L. 2003. Population Dynamics and Critical Habitats of Shortnose Sturgeon in the Altamaha River. GDNR and National Marine Fisheries Service. $210,000. Three-year study funded for 2003-2006.

- Peterson, D. L. 2003. Population Dynamics and Critical Habitats of Atlantic Sturgeon in the Altamaha River. National Fish & Wildlife Foundation. $40,000. One-year study funded for 2003-2004.

- Peterson, D. L. 2003. Reintroduction of Lake Sturgeon in the Coosa River, Georgia. Georgia DNR: $299,721. Five-year study funded for 2003-2008.

- Peterson, D.L. 2002. Feasibility of Siberian Sturgeon Aquaculture in Georgia. One-year pilot study, funded by Tennessee Aquarium and WSFR. $55,000

- Peterson, D. L. 2001. Population Dynamic of Lake Sturgeon in the Muskegon River. Great Lakes Fishery Trust: $98,800. Three-year study funded for 2001-2003.

PENDING GRANT PROPOSALS - UGA

- Peterson, D. L. 2005. Current Status of Shortnose Sturgeon in the Ogeechee River. GDNR: $240,000 over 2 years.

- Peterson, D. L. 2005. Population Dynamics, Essential Habitats, and Factors Affecting Abundance of Atlantic Sturgeon in the Altamaha River, Georgia. NMFS $386,000 over 3-years.

- Peterson, D. L. 2005. Critical Habitat Limitations of Shortnose Sturgeon in the Ogeechee River. Ft. Stuart Base, US Army. $200,000 over 5 years.

- Peterson, D. L. and Nathan Nibbelink. 2005. Risk Assessment of Extensive Tilapia Culture in Georgia. GDNR 50,000 over 2 years

- Peterson, J. and D.L. Peterson. An evaluation of the effect of freshwater inflows on the distribution, recruitment, and survival of juvenile red drum in Georgia estuaries. Georgia Sea Grant $189,000 over 2 years.

FUNDED GRANT PROPOSALS - prior to appointment at UGA

Total Grants Awarded at CMU: 7
Total Extramural Funds Secured in 3 yrs at CMU: $484,020

- Peterson, D.L. 2000. Recruitment Dynamics and Ecology of Juvenile Lake Sturgeon in Black Lake. Michigan Department of Natural Resources: $53,500. Two-year study funded for 2001-2002. Awarded 7/2000

- Peterson, D. L. 2000. Population Dynamics of Lake Sturgeon in Northern Lake Michigan. Michigan Department of Natural Resources, Habitat Improvement Fund: $188,980. Four-year study funded through 2003. Awarded 3/2000

- Peterson, D. L. 2000. Recruitment Dynamics of lake sturgeon in the Manistee River. United States Forest Service: $20,000. One-year pilot study funded through 2000. Awarded 3/2000

- Peterson, D. L. 2000. Critical Habitats of Adult Lake Sturgeon in the Detroit River. United States Environmental Protection Agency, Great Lakes National Program Office: $39,500. Two-year study funded through 2001. Awarded 2/2000

- Peterson, D. L. 2000. Distribution and Movement of Adult Lake Sturgeon in Lake Erie. Ohio Department of Wildlife. $10,000. Two-year study funded through 2001. Awarded 2/2000.

- Peterson, D. L. 1999. Population Dynamics and Fishery Assessment of Smallmouth Bass in Northern Lake Michigan. MI DNR Fisheries Division: $106,040. Three-year study funded through 2002. Awarded 3/1999

- Peterson, D. L. 1999. Abundance, Distribution, and Movements of Adult Lake Sturgeon in the Manistee River. State of Michigan Research Excellence Fund: $66,000. Two-year study funded 2000, Awarded 3/1999

D-29 Southeastern Power Administration (SEPA) letter to CESAM dated 25 May 2006

Department of Energy
Southeastern Power Administration
1166 Athens Tech Road
Elberton, Georgia 30635-6711

May 25, 2006

Colonel Peter F. Taylor, Jr.
District Commander
Mobile District, USACE
P.O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Taylor:

Southeastern Power Administration (Southeastern) has just become aware of the request made by the Mobile District, U.S. Army Corps of Engineers (Corps), in a 22-page letter dated March 7, 2006, to Gail Carmody, Ecological Services, U.S. Fish and Wildlife Service (FWS), to begin a formal consultation process pursuant to Section 7 of the Endangered Species Act of 1973 (ESA).

Southeastern finds it very discouraging that to date our agency has not received any official correspondence or indication that the Corps is, and has been, in the process of Section 7 consultation with the FWS regarding the Gulf sturgeon and the two freshwater mussels (fat threeridge and purple bankclimber) located in the Apalachicola-Chattahoochee-Flint (ACF) river basin. There has been no involvement or input from Federal partners or other basin stakeholders in the development of the Interim Operations Plan.

As mentioned in its letter of March 7, the Corps has made it a goal to release at least 90 percent of basin inflows year round. This will significantly reduce the ability to maintain pool elevations at the four projects in the ACF river basin. Southeastern has entered into a number of long-term commercial contracts for the sale of hydropower generated from these projects. Releases of 90 percent of basin inflows will deplete a significant quantity of storage at these projects during critical springtime months. A reduction in storage of this severity will result in Southeastern's inability to meet its contractual requirements from the amount of water left in the reservoirs. Southeastern will be required to purchase quantities of replacement energy at a significant cost to its power sales customers. The altered river operations and resultant negative impacts on power generation will jeopardize Southeastern's ability to collect sufficient revenue to repay the Federal investment.

Although storage from upstream reservoirs has historically been used to augment flows at the Jim Woodruff Project, these augmentations were made during prolonged low-flow events and were done in support of authorized purposes. Should this release pattern be adopted as a normal practice, the District should conduct an analysis to determine the impacts of this action on authorized project purposes, so the purposes being impacted can be properly compensated for lost benefits. Moreover, the actual volume of storage required to support the discharges from Woodruff should also be identified, and this storage, along with the associated costs, should be reallocated to the benefiting purpose.

Additionally, Southeastern is unaware of any National Environmental Policy Act (NEPA) process to identify potential impacts to upstream environment or basin stakeholders. Southeastern is concerned with the apparent lack of modeling data that can support the operations proposed by the Corps and FWS. Impacts to each authorized purpose must be examined before any change in operation can occur.

Southeastern has had a good relationship with the Mobile District over the past 55 years. We have greatly appreciated the role the District has played in helping fulfill the requirements of the Federal Power Program. However, such actions by the District as described above can go a long way in destroying a good working relationship.

Sincerely,

Kenneth E. Legg
Assistant Administrator for
Power Resources

cc:
BG Michael Walsh, SAD/Atlanta
Leon Cromartie, Mobile District

D-30 SEPA letter to CESAM dated 8 June 2006

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Department of Energy
Southeastern Power Administration
1166 Athens Tech Road
Elberton, Georgia 30635-6711

June 8, 2006

Colonel Peter F. Taylor, Jr.
District Commander
Mobile District, USACE
P.O. Box 2288
Mobile, AL 36628-0001

Dear Colonel Taylor:

Southeastern Power Administration (Southeastern) recently became aware of a "Workshop" hosted by the U.S. Army Corps of Engineers' Mobile District on May 24-25, 2006. We understand that the Corps met with representatives from the States of Georgia, Florida, Alabama, and the U.S. Fish and Wildlife Service to discuss an Interim Operations Plan relating to changes in the operation of the projects on the Apalachicola-Chattahoochee-Flint (ACF) basin for the benefit of Federally-listed sturgeon and mussels. Southeastern, as a major stakeholder in the river basin and a Federal partner with respect to the power program, is concerned that this meeting took place without our participation and, in general, with the lack of information made available by the Mobile District relating to this entire issue.

Southeastern requests that the District share copies of all information which may have been presented or discussed at this meeting including a complete set of handouts, presentations, data results, working papers, summary sheets, and all supporting documents including graphical and tabular analyses that may have been prepared for the May Workshop. In addition, we request the District provide copies of any modeling results, including input files, from any analyses it has conducted related to river basin operation for the Federally-listed sturgeon and mussels under the Interim Operation Plan.

Such information will be very useful to Southeastern as we evaluate the impacts this change in river basin operations will have on the Congressionally-authorized hydropower purpose. Southeastern looks forward to the opportunity to begin work with the District on this important issue.

Sincerely,

Kenneth E. Legg
Assistant Administrator for
Power Resources

cc:
BG Michael Walsh, SAD/Atlanta

D-31 CESAM letter to SEPA dated 11 June 2006, including Memorandum of Record of 24-25 May 2006 Hydrological Modeling Technical Workshop and invitation to follow-on hydrological modeling workshop

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

JUL 11 2006

REPLY TO
ATTENTION OF:

Inland Environment Team
Planning and Environmental Division

Mr. Kenneth E. Legg
Assistant Administrator for
Power Resources
Southeastern Power Administration
Department of Energy
1166 Athens Tech Road
Elberton, Georgia 30635-6711

Dear Mr. Legg:

I have received your letters dated May 25, 2006 and June 8, 2006, regarding formal consultation being conducted pursuant to Section 7 of the Endangered Species Act between the U.S. Army Corps of Engineers (Corps) and the U.S. Fish and Wildlife Service (USFWS) regarding our water management operations at the Jim Woodruff Dam. The Corps requested the initiation of formal consultation on March 7, 2006, regarding the impacts of water management operations and the resultant releases from the Jim Woodruff Dam on federally listed species and critical habitat on the Apalachicola River (the threatened Gulf sturgeon and its critical habitat, the endangered fat threeridge mussel, and the threatened purple bankclimber mussel). Our request included the description of an Interim Operations Plan (IOP) that describes how releases would be made from the Jim Woodruff Dam to minimize impacts on the federally protected species pending future revisions to the Apalachicola, Chattahoochee, Flint River Basin water control plan. Modeling of the IOP is being conducted by the Corps and the USFWS to address the potential impacts of our water management operations at Jim Woodruff Dam and releases to the Apalachicola River on the federally listed species and critical habitat, as well as the anticipated impact on Federal project purposes. In order to assure that the appropriate modeling approach and assumptions are used in this modeling, the Corps and USFWS jointly hosted a technical workshop on May 24-25, 2006. Technical representatives from each of the States of Alabama, Florida and Georgia were invited to participate in the workshop. A copy of the Memorandum for Record of the workshop discussions and copies of presentations made by participants in the workshop are enclosed for your information.

As a result of continuing consultation discussions with the USFWS and consideration of preliminary modeling results, the Corps submitted a revised IOP for consideration by the USFWS on June 12, 2006. Copies of our original request to initiate formal consultation and our revised IOP for consideration by USFWS have been posted on the Mobile District website under Hot Topics: http://www.sam.usace.army.mil. Preliminary modeling results of the revised IOP are posted on the Mobile District FTP site: ftp.sam.usace.army.mill/pub/actacf. However, we are continuing to refine our modeling of the IOP. We have scheduled a follow-on workshop to explain the IOP, adjustments to the IOP, and our modeling approach. The one-day workshop will be held on Wednesday, July 12, 2006, in Columbus, Georgia (you have received a notice with additional details). We will take your current comments and any future comments into consideration in deciding upon any other revisions to the IOP.

By law, the Final Biological Opinion must be completed within a 135-day period or July 21, 2006, unless the Corps and USFWS mutually agree to an extension. This timeframe is comprised of 90 days of formal consultation, during which information is gathered and consultation discussions occur; and an additional 45 days for USFWS to complete the Biological Opinion. By letter dated June13, 2006, the USFWS requested a 45-day extension of the consultation period. We have reviewed their request and agreed that it is appropriate to extend the consultation period for an additional 45 days to September 5, 2006.

The remainder of your comments relate to project operations, anticipated impacts and suggested changes to the IOP. I have been advised that any comments on the IOP, or proposed changes to the IOP or consultation schedule should be handled through the ongoing mediation discussions between the Corps and the States of Alabama, Florida and Georgia. Therefore, the Corps mediation representative, Ms. Karen Durham-Aguilera, will provide any formal response to your concerns, if necessary, pending the results of her discussions with the parties involved with the mediation.

Thank you for your assistance.

Sincerely,

Peter F. Taylor, Jr.
Colonel, Corps of Engineers
District Commander

Copy furnished:

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

D-32 Atlanta Regional Commission letter to CESAM dated 17 August 2006

KING & SPALDING

King & Spalding LLP
1180 Peachtree Street N.E.
Atlanta, Georgia 30309-3521
www.kslaw.com

Patricia T. Barmeyer
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July 17, 2006

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

Re: Interim Operations Plan for Jim Woodruff Lock and Dam

Dear Mr. Flakes:

On behalf of the Atlanta Regional Commission ("ARC"), I am writing to express our objections to the Interim Operations Plan ("IOP") for Jim Woodruff Lock & Dam ("JWLD") and the process used to develop it. Our chief concern is that this plan is not sustainable and that it will unduly compromise the security of our water supply. We are also concerned because the plan was developed without stakeholder input and without sufficient analysis of its impact to the system as a whole. A change of this magnitude should not have been implemented without full analysis in accordance with applicable procedural requirements.

On this procedural point, we are especially distressed by recent statements suggesting that the IOP will remain in effect until the Water Control Plan for the entire Apalcachicola-Chattahoochee-Flint ("ACF") River system is updated. This is not how the IOP was described when it was first announced in your March 7, 2006 letter to the U.S. Fish and Wildlife Service ("FWS") initiating formal consultation. In that letter, you identified the subject of the Section 7 consultation as being "existing operations." *See* Letter from Curtis M. Flakes, U.S. Army Corps of Engineers to Gail Carmody, U.S. Fish and Wildlife Service (Mar. 7, 2006) at 3. You stated in that letter that the IOP would remain in effect only "until formal Section 7 consultation can be completed on . . . the *existing water control plans for the ACF basin*." The scope of consultation changed on June 12, 2006, when you submitted proposed revisions of the IOP to FWS. In that letter, the subject of the consultation was changed from the "existing water control plan" to the IOP itself. Further, the June 12 letter also stated that the IOP will remain in place "until the existing Water Control Plan is updated at a future date." *See* Letter from Curtis M. Flakes, U.S. Army Corps of Engineers to Gail Carmody, U.S. Fish and Wildlife Service (June 12, 2006) at 1. The June 12 letter dramatically changed the nature of the IOP.

The end result of this shift in the subject of consultation — from existing operations to the IOP — is that a major change in the operations of JWLD was adopted without any prior notice to stakeholders, without a full and complete evaluation of its impact to upstream reservoirs and to other project purposes, and without consideration of any alternatives.

Furthermore, this plan was adopted *before* FWS rendered any opinion as to whether the "existing water control plan" in effect prior to the IOP was likely to have an adverse effect on species protected by the ESA.

The Corps' decision to skip the step of consulting with FWS on existing operations creates significant legal problems for the validity of the IOP. Because FWS has not yet issued an opinion as to whether pre-IOP operations were likely to adversely affect protected species, we do not have any definitive statement from FWS indicating whether or how operations at JWLD needed to be changed. In the absence of a biological opinion from FWS, the IOP must be viewed as a discretionary change to the water control plan for JWLD as opposed to one mandated by the ESA. Consistent with applicable regulations and laws such as the National Environmental Policy Act, discretionary changes of this magnitude should only be made after public input, after full consideration of environmental impacts and impacts to other project purposes, and after all reasonable alternatives have been evaluated.

Accordingly, we formally request that you put the existing consultation with FWS back on track as a consultation regarding the existing water control plan. Consistent with its original purpose, as stated in the March 7 letter to FWS, the IOP should remain in place only until the biological opinion is issued.

In the meantime, ARC will be working with its experts to develop alternatives for your consideration and review. To the extent any changes need to be made to comply with the ESA, which has not been demonstrated, our experts assure us that many alternatives exist to the IOP. We will also be writing under separate cover to make further inquiries about the biological basis for the IOP and about other issues, such as the environmental baseline that will be used by FWS to evaluate alternatives. I urge you to receive and respond to these submissions in the spirit in which they will be offered, which is a desire to be constructive and to participate in decisions of tremendous importance to our vital interests.

Very Truly Yours,

Patricia T. Barmeyer

cc: Mr. Charles Krautler, Atlanta Regional Commission
Ms. Gail Carmody, U.S. Fish and Wildlife
Mr. James Maysonette, U.S. Dept. of Justice

D-33 Hydrological Modeling Technical Workshop – 12 July 2006

Jim Woodruff Dam Water Management Operations
Section 7 Consultation
Hydrological Modeling Technical Workshop II

Columbus Convention and Trade Center
801 Front Street, Columbus, Georgia
12 July 2006
8:00 a.m. EDT

Workshop Objectives:

- Provide background information regarding the requirement to consult under the Endangered Species Act, what has been done to date regarding informal and formal Section 7 consultation, and actions needed to complete Biological Opinion
- Provide additional information on the biological basis for elements of the Interim Operations Plan
- Provide an update on status of hydrological modeling of the Interim Operations Plan (especially the modeling approach and underlying assumptions)
- Provide an opportunity for clarification and understanding of the modeling process
- Provide an opportunity for the Corps to listen to and understand specific concerns regarding the modeling and consultation process.

Roger Burke	**Welcome, Introductions, Opening Comments**
Roger Burke	**Review Workshop Goals, Agenda, and Ground Rules**
Gail Carmody	**Requirements of Endangered Species Act / Section 7 Consultation / Next Steps in Process of Developing a Biological Opinion** **Questions and Answers**
Joanne Brandt	**Informal Consultation, Formal Section 7 Consultation, Biological Basis of IOP, Elements of Initial IOP** **Questions and Answers**
Doug Otto	**Lessons Learned / Basis for Revised IOP** **Questions and Answers**
James Hathorn	**Summary of Modeling of Revised IOP by COE, Modeling Approach and Assumptions** **Questions and Answers**
ALL	**Open Discussion of Modeling Approach and Assumptions**

[This workshop is intended as a full 1-day workshop. Discussions will be open-ended, but the intention is to cover all material by the end of the day. There will be a lunch break and two other brief breaks scheduled during the day.]

Endangered Species Act Overview

For Federal Agencies

Endangered Species Program,

U.S. Fish and Wildlife Service

PCFL July 2006

Sea Turtles

Gulf sturgeon

Electro shocking

Beach mouse recovery

Feeding red cockaded woodpeckers

Stocking fish

PAPERWORK!

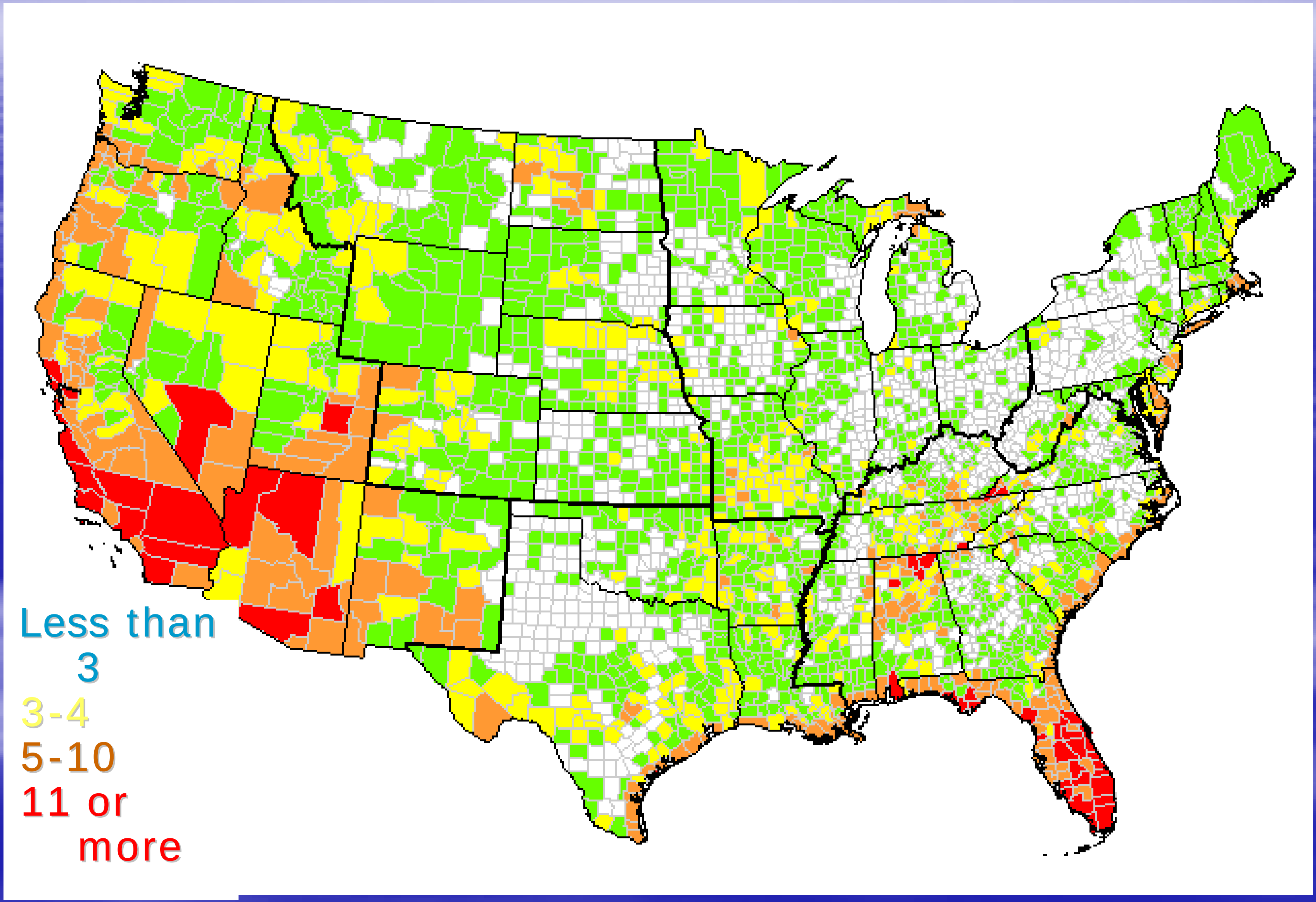
Outreach

GIS Mapping

Purposes of ESA

- Provide a means to conserve ecosystems of threatened and endangered species
- Establishes a program for the conservation of threatened and endangered species

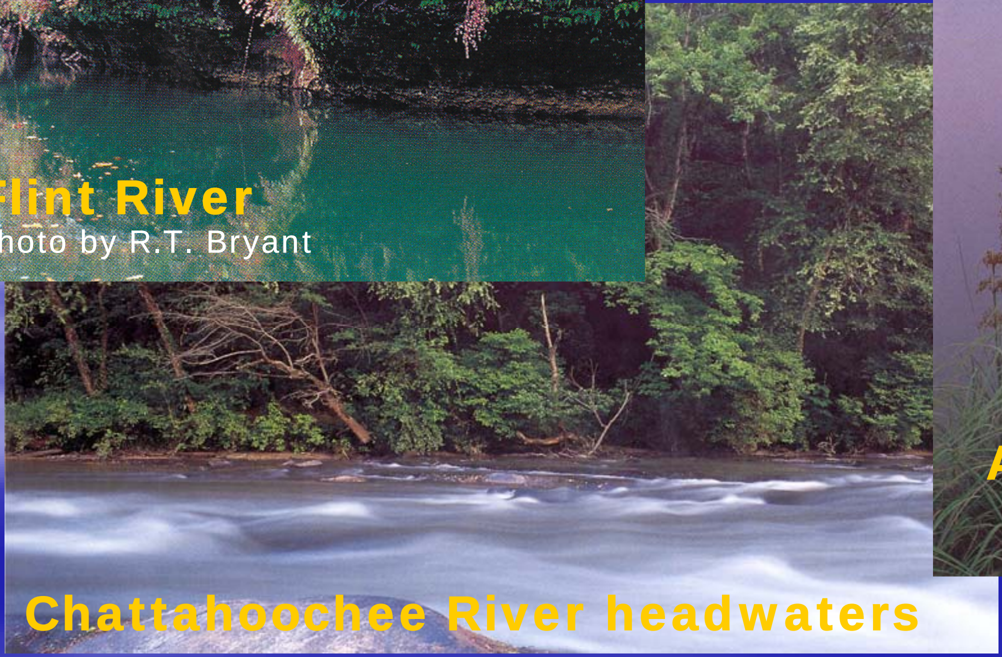
Distribution of Listed Species by County, 1995



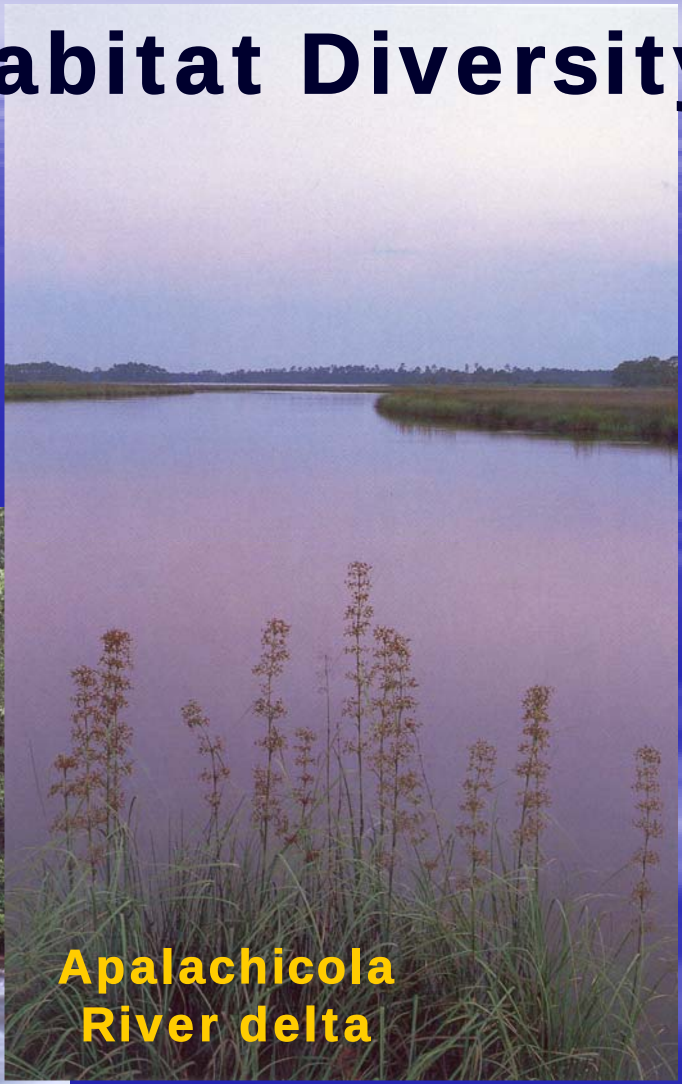
Source: U.S. Environmental Protection Agency

ACF Basin Aquatic Habitat Diversity

Flint River
Photo by R.T. Bryant



Chattahoochee River headwaters



Apalachicola River delta

Photos by J. & M. Cook

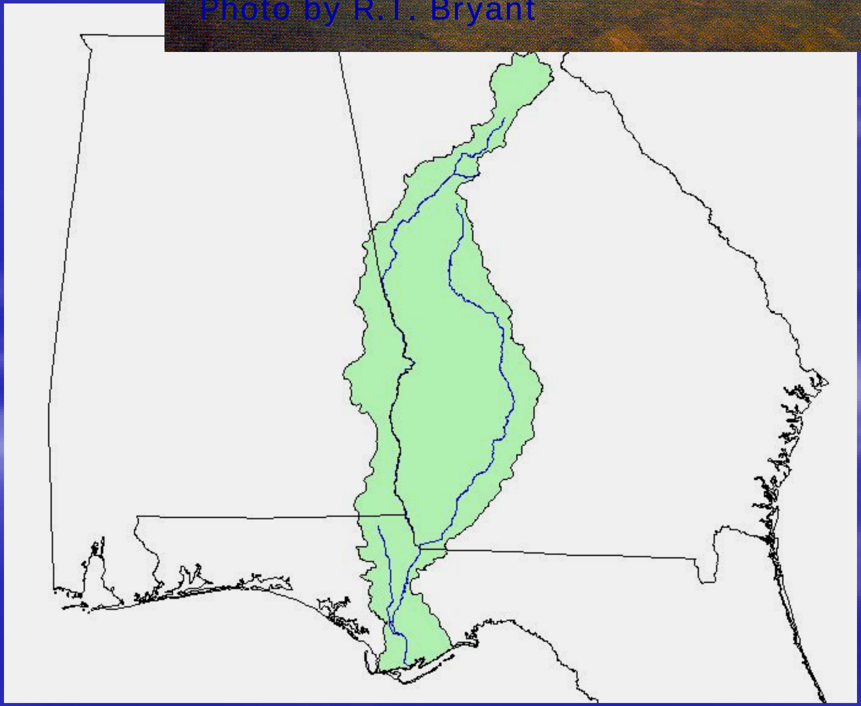
ACF Basin Aquatic Biodiversity

- Fish: 122 species
- Mussels: 29 species
- Crayfish: 30 species

- Highest US density reptiles & amphibians

- Estuary one of most productive fisheries in North America

- Flint River: 214 miles without a dam



ESA-listed species in the ACF

Gulf sturgeon

Fat three-ridge

Shiny-rayed pocketbook

Purple bankclimber

All ESA-Listed Aquatic Species in the ACF Basin

7 species

Fish

Gulf sturgeon(T)

Mussels

Fat threeridge (E)
Chipola slabshell (T)
Purple bankclimber (T)
Shiny-rayed pocketbook (E)
Gulf moccasinshell (E)
Oval pigtoe (E)

Endangered Species Act

- Response to accelerated decline of species
- Purpose is to conserve ecosystems
- Listing a species is a 911 call
- Active conservation to prevent listing and allow delisting

Definitions

- Endangered

  Any species in danger of extinction throughout all or a significant portion of its range

- Threatened

  Any species likely to become endangered in the foreseeable future in all or a significant portion of its range

Endangered Species Act

- Sec. 4 requires listing if possible extinction, requires recovery planning
- Sec. 7 requires Federal agency consultation
- **Sec. 9 prohibits take of a species**

Sec. 7 Consultation

- Every Federal agency must be in compliance with the ESA

- and use their authorities to further the purposes of the Act

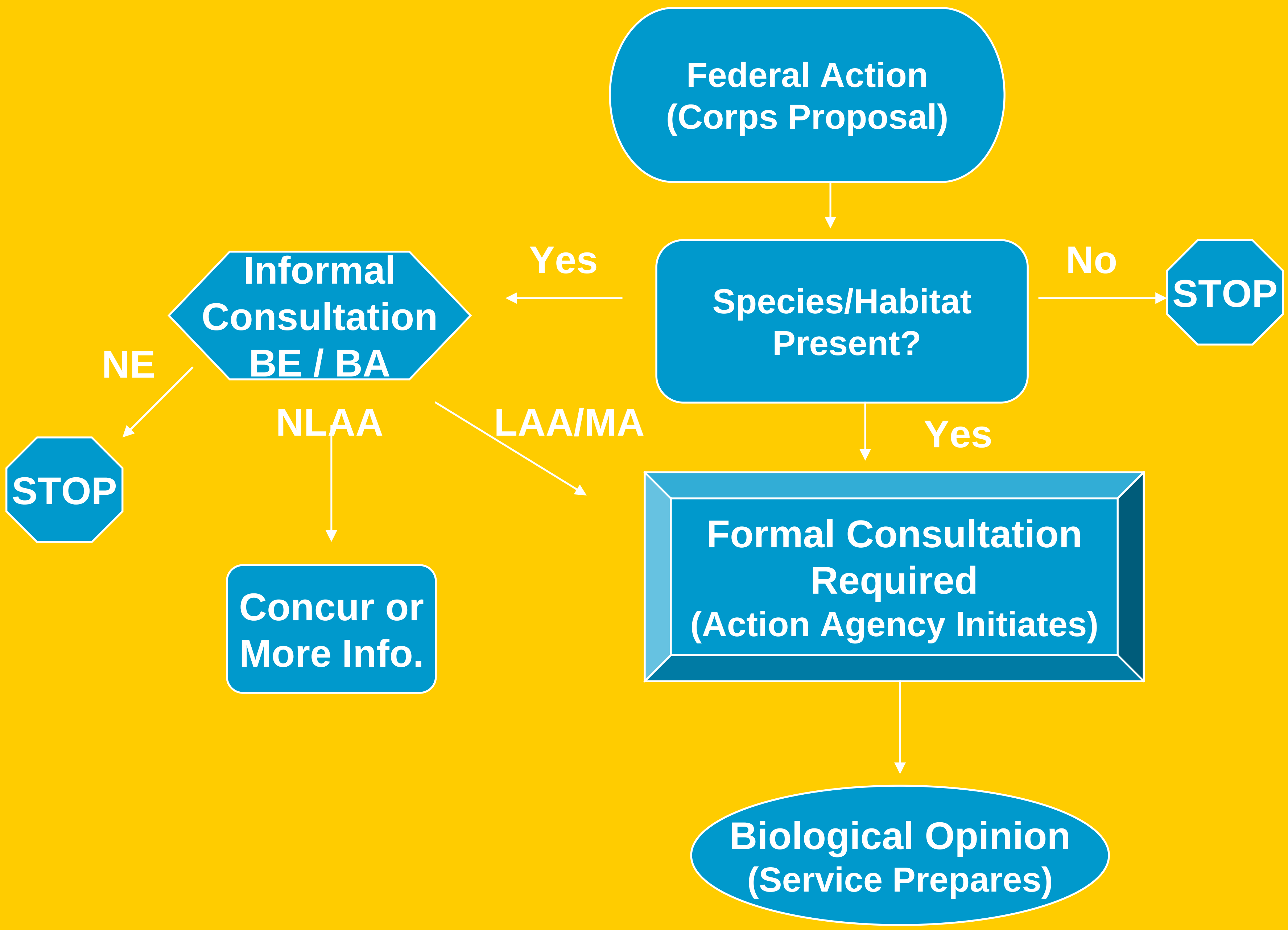
Sec. 7 Consultation

- The role of the Service is to help the action agency be in compliance and avoid Section 9 violation and penalties

- See Consultation Handbook for guidance
  - (www.fws.gov)

Interagency Consultations

- Applies to all discretionary federal actions that:
  - an agency funds, carries out or permits and
  - may affect a listed species or critical habitat
- More than 70,000 actions reviewed annually
- Conflicts frequently resolved with minor project modifications completed concurrently with other project planning


Federal Action
(Corps Proposal)
Species/Habitat Present?
Yes
No
STOP
Informal Consultation BE / BA
NE
STOP
NLAA
LAA/MA
Concur or More Info.
Yes
Formal Consultation Required
(Action Agency Initiates)
Biological Opinion
(Service Prepares)

Formal Consultation
Information Needs and Initiation

- ESA requires the action agency to provide the best scientific and commercial data available.

- Within 30 days, the Service provides written acknowledgment of consultation request and advises of any data deficiencies.

Formal Consultation Time Requirements

- Clock starts when adequate information is provided including Biological Assessment
- Consultation - 90 days
- Biological Opinion - 45 days
- Can be extended if mutually agreed

Typical Biological Opinion

- Describes the proposed action
- Summarizes the status of the species and critical habitat
- Describes the baseline
- Determines effects of action including cumulative
- Conclusion – jeopardy or adverse modification?
- Incidental take statement and measures to minimize harm
- Conservation recommendations

Biological Opinion

- Take?

No → Done (uncommon)

Yes → Incidental Take Statement to permit otherwise prohibited actions

Section 9

- **The take prohibition for wildlife applies to any person including a Federal agency.**

- “Prohibited Acts” - Prohibit import or export or transport of listed wildlife or plants; also prohibit take and possession of wildlife - but not plants.

Section 9

- “Take” - to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in such conduct.

Harm

"Significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering" (50 CFR 17.3)

Incidental Take

"Take" resulting from, but not the purpose of, an otherwise lawful activity

- Only applies to levels of take that do not cause jeopardy or adverse modification
- Includes reasonable and prudent measures to minimize the take
- Terms and conditions are non-discretionary

Reasonable and Prudent Measures

- All reasonable measures to avoid and minimize extent of take.

- Mandatory.
- Includes monitoring
- Terms and Conditions - included as permit conditions or project plans.

Terms and conditions

- specific methods to accomplish each RPM
  - **clear, precise and enforceable**
  - **only minor changes to proposed action (can’t alter basic design, location, scope, duration, or timing)**
  - **include reporting and monitoring requirements**
  - **salvage and disposition of species**

Biological Opinion

- Draft BO is submitted to Action agency for review
- Federal agency comments completes consultation on reasonable and prudent measures

Endangered Species Act

- It's about:

- Ecosystems
- Active conservation partnerships
- Balancing species' needs with people's needs
- Early planning and coordination is best

Jim Woodruff Dam

Section 7 Consultation

Hydrological Modeling Technical Workshop II

12 July 2006

Endangered Species Act of 1973
Section 7 Consultation

- "All Federal agencies shall, in consultation with and with the assistance of the Secretary of the Interior/Commerce, insure that any actions authorized, funded, or carried out by them do not jeopardize the continued existence of any endangered species or threatened species, or result in the destruction or adverse modification of habitat of such species which is determined by the Secretary (Interior/Commerce) to be critical, unless an exception has been granted by the Endangered Species Committee."

Federally Listed Species and Critical Habitat on Apalachicola River

- Gulf sturgeon – listed as threatened in Sep 1991
- Gulf sturgeon critical habitat listed Mar 2003
- Fat threeridge mussel – listed as endangered in Mar 1998
- Purple bankclimber mussel – listed as threatened in Mar 1998
- USFWS also proposed critical habitat for listed mussels on 6 June 2006 – includes Apalachicola River

ESA-listed species on Apalachicola River

Gulf sturgeon

Fat threeridge

Purple bankclimber

Section 7 Consultation

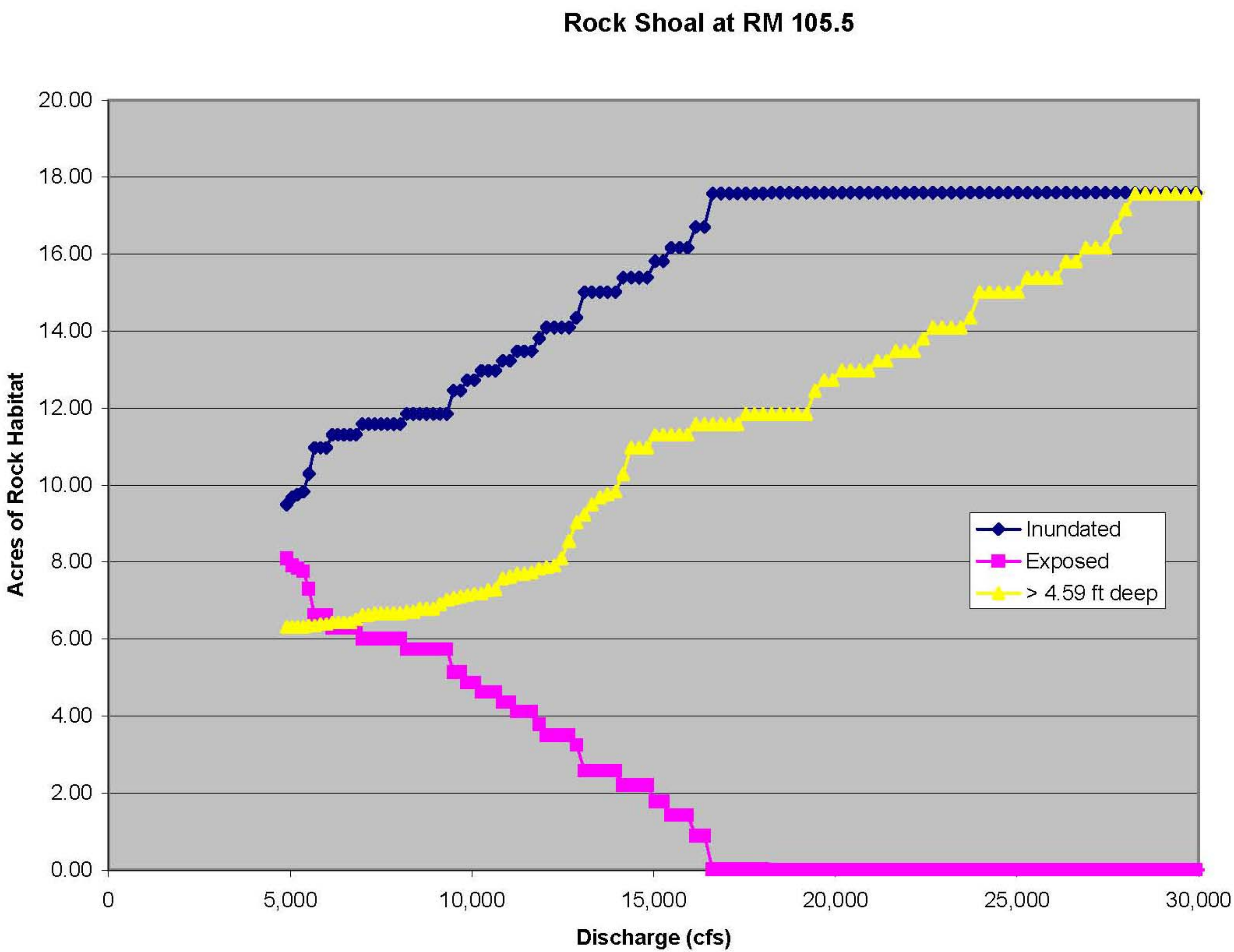
- Mobile District has been informally consulting with USFWS since 2000 on potential for impact of existing water management operations to Gulf sturgeon and mussels
  - Impact of navigation window in Spring 2000 on fish spawning in Apalachicola River
  - Impact of drought operations on mussels in summer of 2000
  - Impact of reservoir fish spawn management on Apalachicola River/Gulf sturgeon spawning in 2002
  - Impact of low flow operations on Gulf sturgeon and mussels in 2004

Informal Consultation

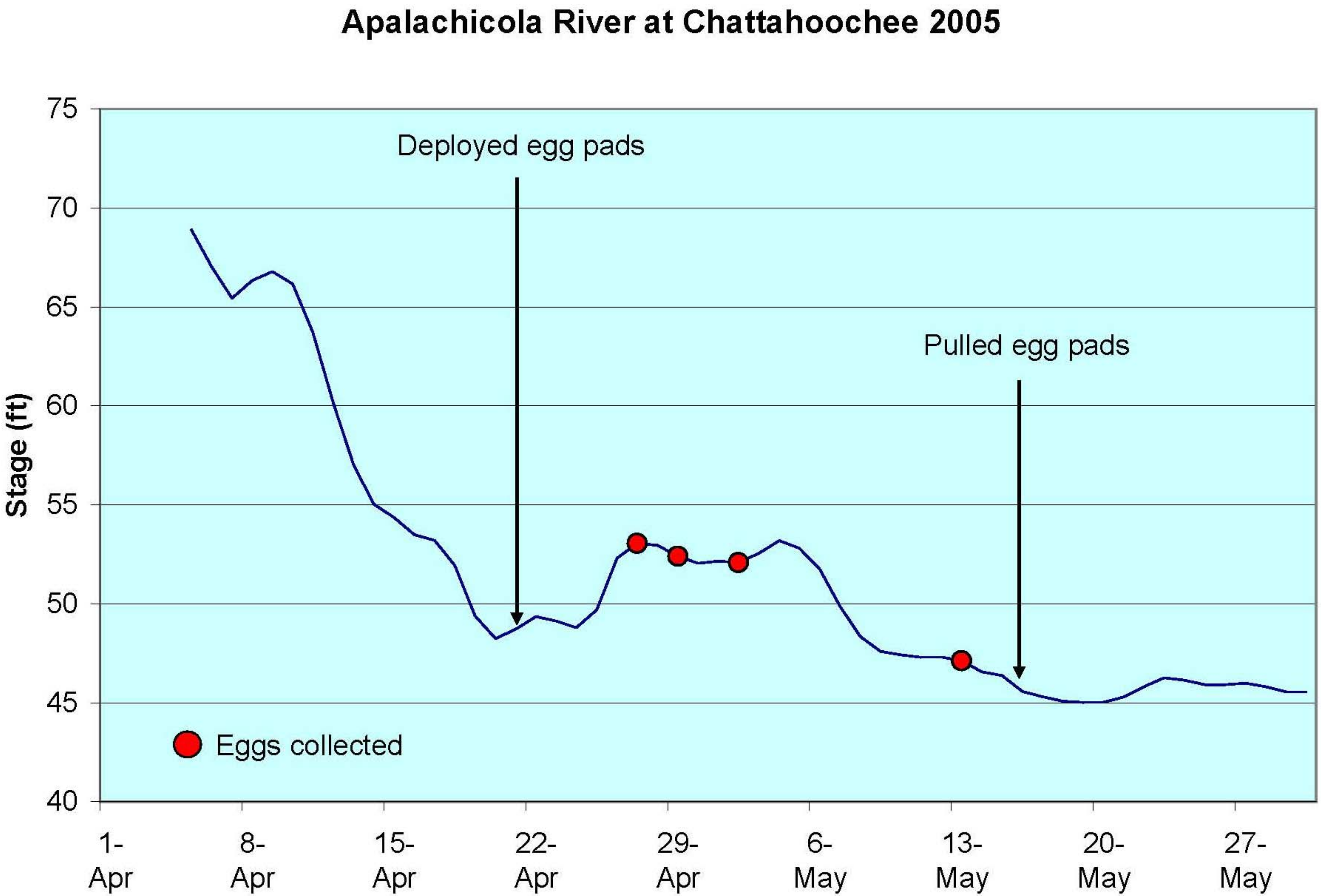
- Potential for impact to Gulf Sturgeon or critical habitat for Gulf sturgeon
- Potential for impact to listed mussel species
- Surveys of Gulf sturgeon spawning habitat and flow/depth study
- Mussel surveys and flow/depth distribution study
- Draft SOP for fish spawn operations to include management for Apalachicola River species in addition to reservoir fish spawn management – annual meetings
- Development of low flow operations protocol for Gulf sturgeon and mussels in 2004 (i.e., match releases to basin inflows; therefore impacts due to declining basin inflows rather than discretionary water management actions)

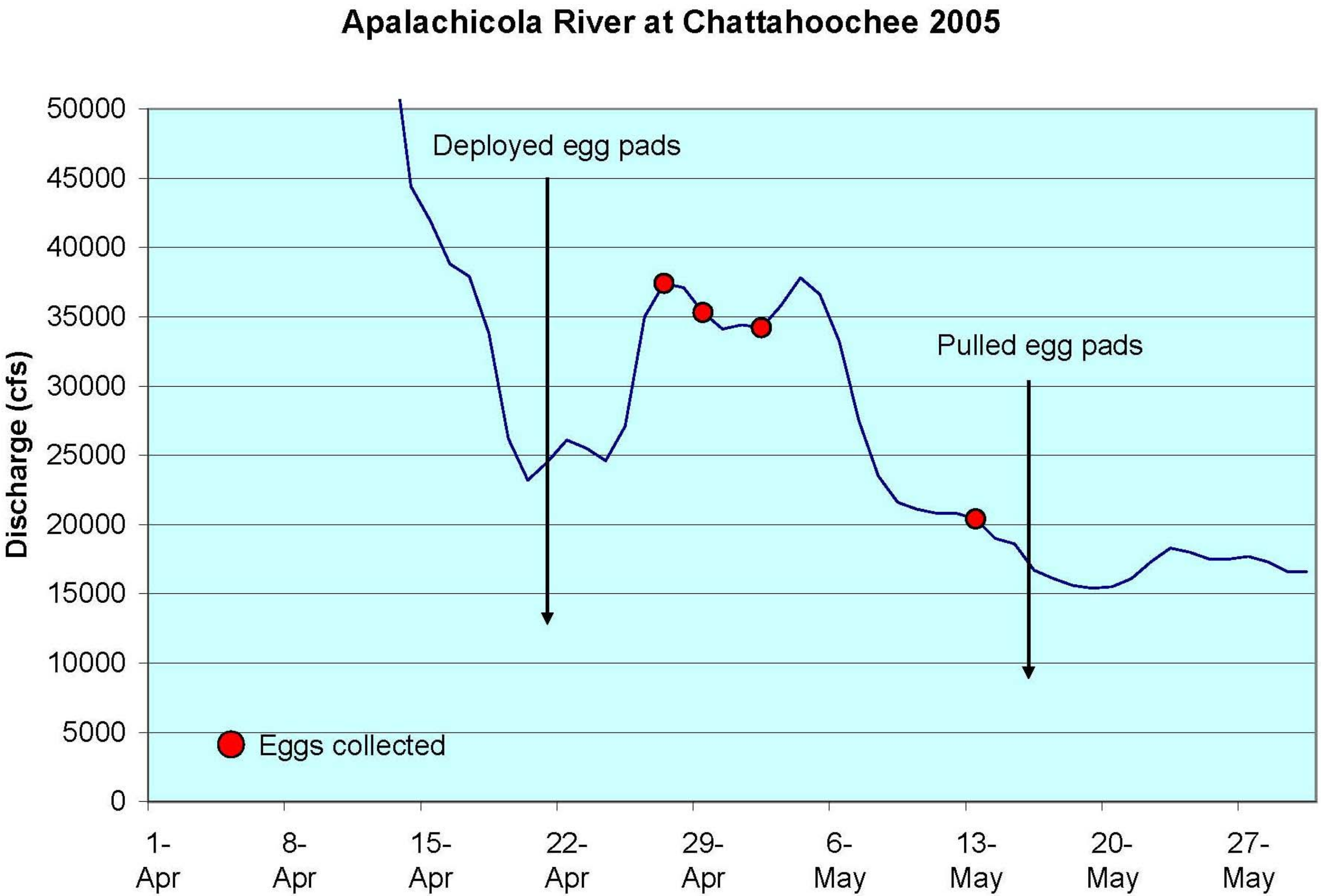
Gulf Sturgeon Spawning Flow Requirements

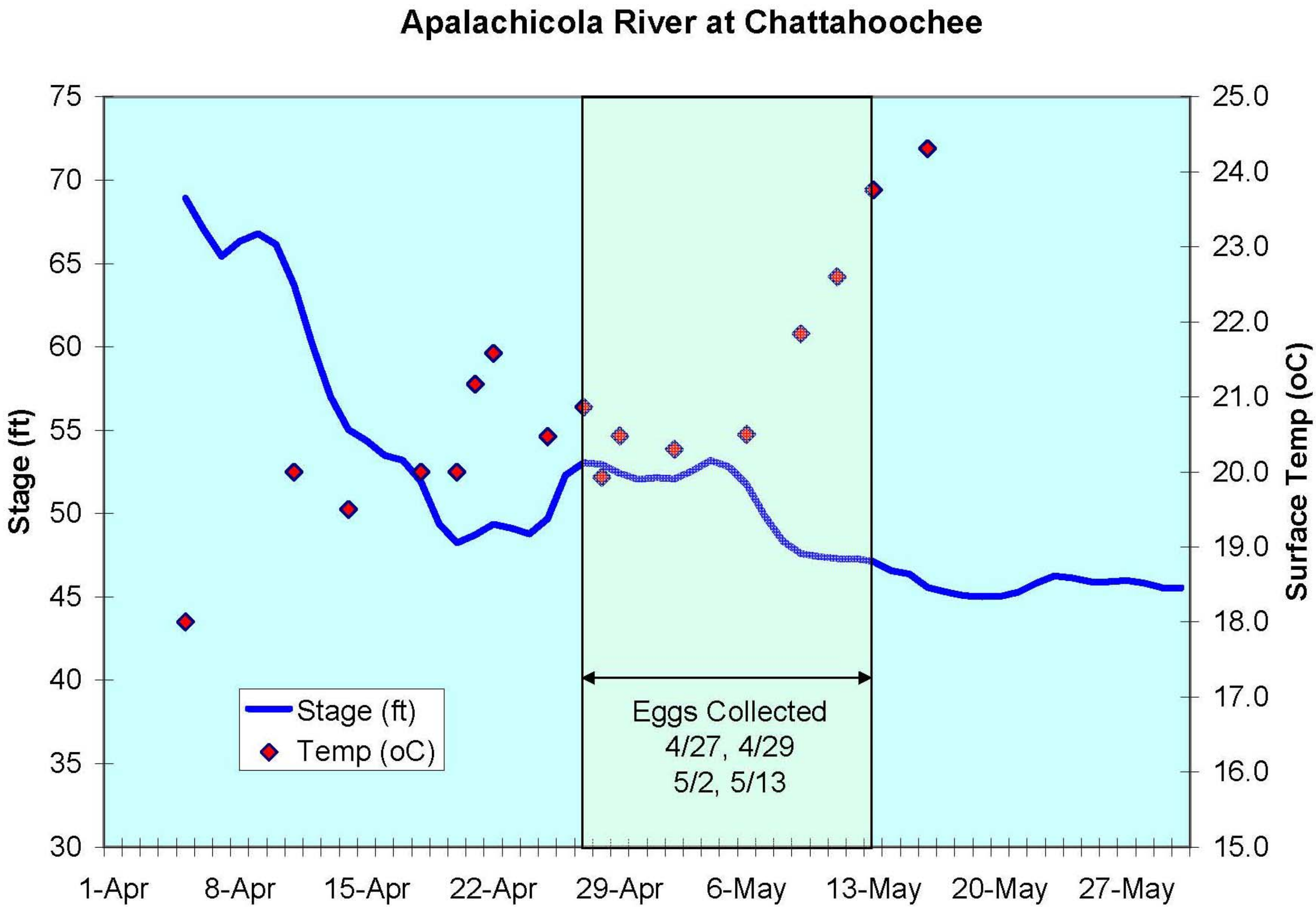
- Sampling in 2005 collected sturgeon eggs on rock ledge at NM 105 at flows between 37,400 cfs and 20,400 cfs
- 20 eggs collected at depths ranging from 7.5 ft to 20.1 ft. from 17 samples on 4 dates
- Rock ledge at NM 105 is completely inundated to depth of 4.5 ft. at flows of 30,000 cfs
- At flows of 20,400 cfs approx. 75% of rock ledge is inundated to depth of 4.5 ft.
- Rock ledge at NM 105 becomes exposed at flows of 16,000 to 18,000 cfs
- Spawning habitat and adequate flow regime are primary constituent elements of critical habitat



Rock Shoal at RM 105.5
20.00
18.00
16.00
14.00
12.00
10.00
8.00
6.00
4.00
2.00
0.00
Acres of Rock Habitat
0
5,000
10,000
15,000
20,000
25,000
30,000
Discharge (cfs)
Inundated
Exposed
> 4.59 ft deep


Apalachicola River at Chattahoochee 2005
Stage (ft)
75
70
65
60
55
50
45
40
Deployed egg pads
Pulled egg pads
Eggs collected
1-
Apr
8-
Apr
15-
Apr
22-
Apr
29-
Apr
6-
May
13-
May
20-
May
27-
May


Apalachicola River at Chattahoochee 2005
Discharge (cfs)
50000
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
Deployed egg pads
Pulled egg pads
Eggs collected
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May


Apalachicola River at Chattahoochee
Stage (ft)
Surface Temp (oC)
75
70
65
60
55
50
45
40
35
30
25.0
24.0
23.0
22.0
21.0
20.0
19.0
18.0
17.0
16.0
15.0
1-Apr
8-Apr
15-Apr
22-Apr
29-Apr
6-May
13-May
20-May
27-May
Stage (ft)
Temp (oC)
Eggs Collected
4/27, 4/29
5/2, 5/13

Flow Requirements for Protected Mussels

- Endangered fat threeridge mussel and threatened purple bankclimber mussel occur on the Apalachicola River
- Mussel surveys completed in the mid-1990s through 2003
- Mussel population locations and relative depth distribution have been correlated to flows
- Mussels begin to become exposed at flows of 8,000 cfs or less
- FWS has stated that continued existence of mussels could be jeopardized at flows less than 5,000 cfs
- Additional flows also required to support needs of host fish for mussels (spawning, nursery and feeding areas)

Table 6. An estimate of the percentage of *A. neislerii* that would be exposed to the atmosphere at three locations at discharges of 3,000-10,000 cfs, Apalachicola River, Florida, 2003.

Location	NM	Estimated Mussels	Discharge, cfs 3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
A	30.0	11.0	6.1	5.2	2.1	0.0	0.0	0.0	0.0	0.0
B	41.5	42.6	42.6	36.3	32.8	25.5	6.6	0.0	0.0	0.0
B	41.5	3.0	3.0	2.6	2.3	1.8	0.5	0.0	0.0	0.0
B	46.8	3.8	3.8	3.2	2.9	2.3	0.6	0.0	0.0	0.0
B	48.4	5.3	5.3	4.5	4.1	3.2	0.8	0.0	0.0	0.0
B	48.4	1.5	1.5	1.3	1.2	0.9	0.2	0.0	0.0	0.0
B	49.0	3.0	3.0	2.6	2.3	1.8	0.5	0.0	0.0	0.0
C	73.3	10.5	8.8	7.0	4.9	3.6	1.6	0.8	0.0	0.0
C	73.3	1.0	0.8	0.7	0.5	0.4	0.1	0.1	0.0	0.0
C	73.3	34.7	29.2	23.1	16.1	13.5	5.1	2.6	0.0	0.0

An estimate of the percentage of *A. neislerii* that would be exposed to the atmosphere at three locations at discharges of 3,000 –10,000 cfs, Apalachicola River, Florida, 2003.

			3,000	4,000	5,000	6,000	7,000	8,000	9,000	10,000
A			55.0	47.0	19.1	0.0	0.0	0.0	0.0	0.0
B			100.0	85.1	77.0	59.8	15.4	0.0	0.0	0.0
C			84.1	66.5	46.3	33.9	14.8	7.4	0.0	0.0

Locations A, B, and C, include sites at the following Navigation Miles:

A	30.0
B	41.5, 46.8, 48.4, 49.0
C	73.3

Informal Consultation Ramping Rates

- Attempt to mimic “natural flows”
- Minimize impacts on downstream habitat
- Minimize trapping of fish in out-of-bank or floodplain pools after high flows
- Reduce exposure/mortality of mussels
- Reduce bank sloughing
- Rates: 0.5 to 1.0 ft per day when flows are less than 20,000 cfs; Goal of 0.5 ft per day or less during fish spawning and for mussels during low flow operations

Formal Section 7 Consultation

- Interim Operations Plan for releases from Jim Woodruff Dam to the Apalachicola River
  - Incorporates elements developed or agreed to during informal consultation
  - Based on basin inflow and incorporates new information collected during informal consultation
- Formal Section 7 consultation requested on 7 March 2006
- FWS letter dated 9 March 2006 – intent to complete Formal Consultation by 21 July 2006

Intent of Interim Operations Plan

- Provide year-round operations to support flow needs for sturgeon spawning, young sturgeon, mussels, and host fish for mussels
- Minimize or avoid impacts of low flow operations on listed species or critical habitat
- Provide for storage when water is more plentiful to allow for future augmentation during low flows in support of mussels
- Minimize conflicts with management for other fish and wildlife species (e.g., reservoir fish management)
- Minimize impact to other project purposes

Interim Plan for March - May

Based on Basin Inflows (BI)

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI >20,400 and < 37,400 cfs, outflow $\geq$ 20,400 cfs and at least 70% of BI
- If BI $\leq$ 20,400 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

Interim Plan for June - February

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI >8,000 and < 37,400 cfs, outflow > 8,000 cfs and at least 70% of BI
- If BI $\leq$ 8,000 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

Interim Plan Ramping Rates

- Exceeds Powerhouse Capacity (18,000 cfs)

  0.5 to 1.0 ft/ day*
- Within Powerhouse Capacity and >8,000 cfs

  0.25 to 0.5 ft/day*
- Within Powerhouse Capacity and $\leq$8,000 cfs

  0.25 ft/day or less*

*Consistent with safety requirements, flood control operations, and equipment constraints

U.S Army Corps of Engineers, Mobile District
Interim Operations at Jim Woodruff Dam
and Releases to the Apalachicola River
In Support of Listed Mussels and Gulf Sturgeon

Minimum Releases

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
March - May	>= 37,400	not less than 37,400	Max. known flow of sturgeon spawning in the Apalachicola. All of rock shoal inundated by more than 4.59 ft. Majority of floodplain aquatic habitat (61%) in which mussel fish hosts may spawn is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 20,400 and < 37,400	>= 70% to 90% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases between 70% and 90% of basin inflow would still provide access for spawning to between 74% and 100% of the rock ledge habitat at NM 105.
	< 20,400	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
June - February	>= 37,400	not less than 37,400	Majority of floodplain aquatic habitat (61 %) in which mussel fish hosts may spawn and rear is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 8,000 and < 37,400	> 70% to 90% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 10% of BI (i.e., releasing >= 90% BI) in this flow range would insignificantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (store some water from rain events) in order to allow some refill for future augmentation flows. Water stored during these conditions would be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
	< 8,000	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~18,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less whenever flows are less than 20,000 cfs, and less than 1.0 ft/day at flows greater than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions.
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cababilities.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS recommends the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 37,400 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a sliding percentage between 90% and 70% BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% to 90% BI release would assure that at least 74% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on other habitat or host species requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

Interim Operations Plan

- Numbers in Plan subject to change based on new information
  - E.g., Powerhouse capacity = 16,000 cfs
  - Results of 2006 sturgeon spawning monitoring and habitat mapping efforts?
  - How to calculate basin inflows?
  - How to account for ramping rates?
  - What is appropriate threshold for flood control operations?

Adjustments to IOP Submitted to USFWS on 12 June 2006

- Based on “Lessons Learned”
- Use Chattahoochee gage, 7-day average and volume computations to measure basin inflow and releases to smooth releases and minimize over-releases
- Include “mini-peaking” operations at JWD
- Adjust upper flow threshold Jun-Feb to provide for more opportunities for storage
- Clarify flood control flows and ramping rates

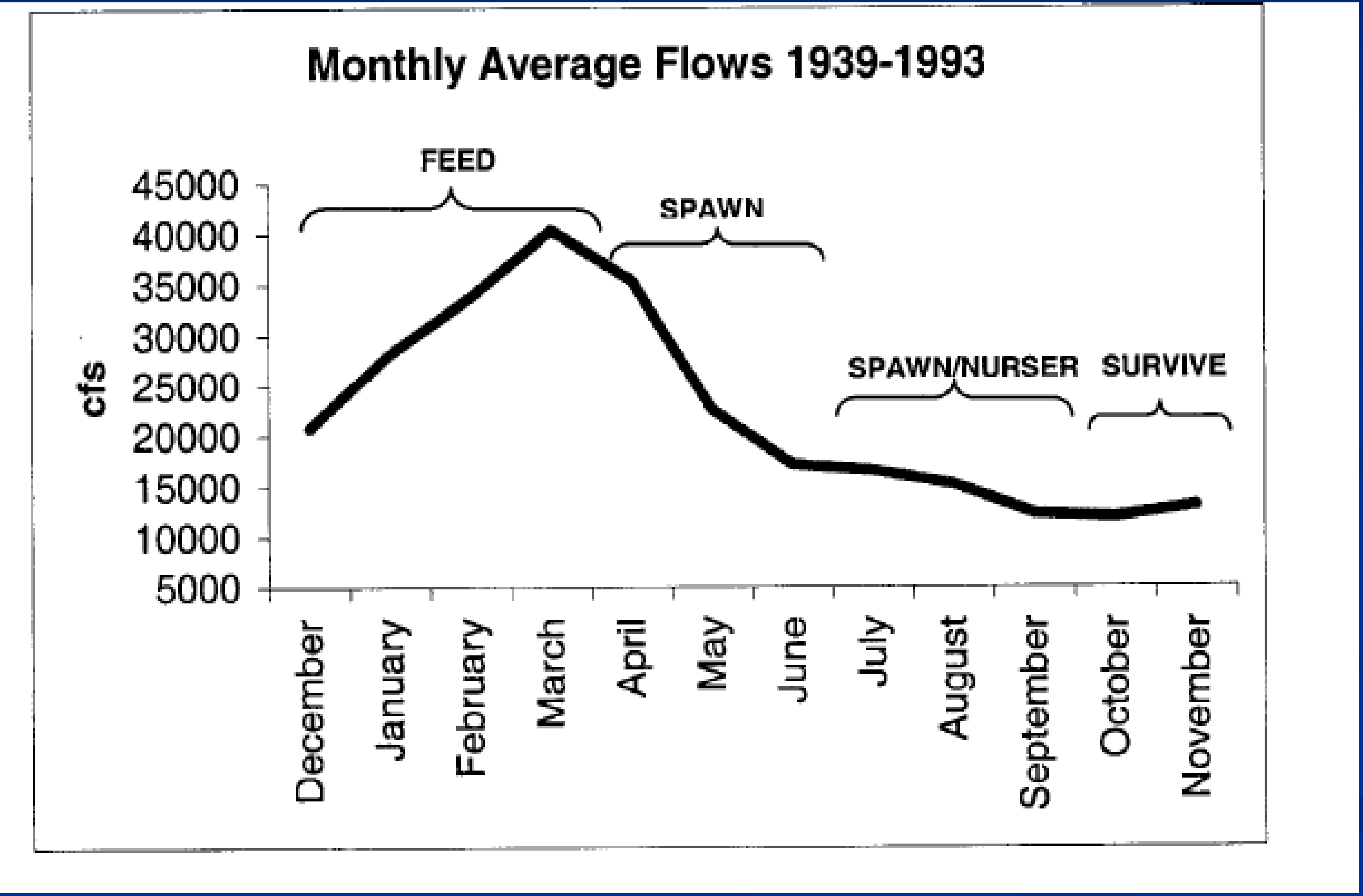
Proposed Adjustment to Jun-Feb Upper Threshold

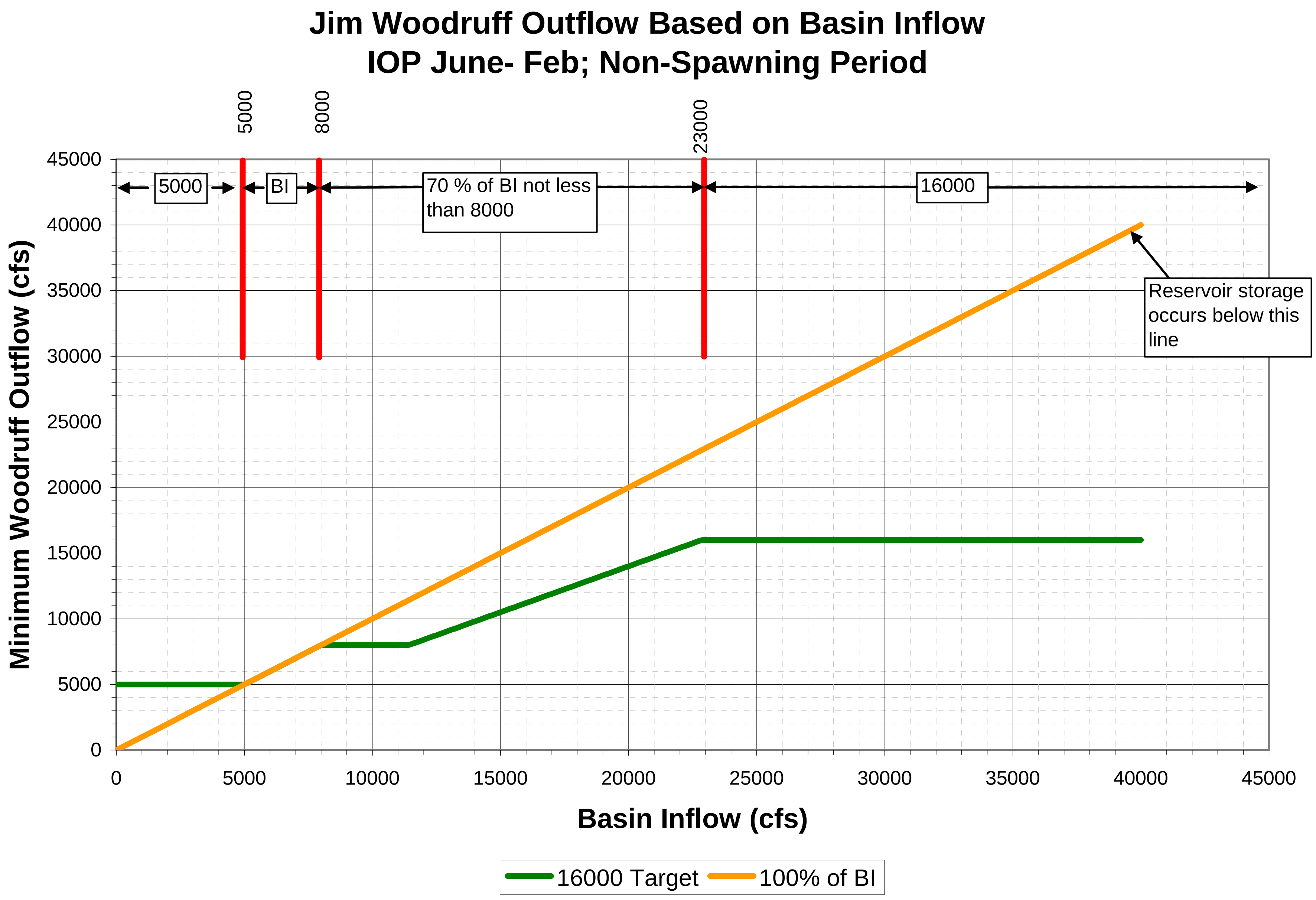
- Intent to provide sufficient flows when available for access to the adjacent floodplain by host fish for mussels
- Average monthly flows for Jun – Aug approximately 16,000 cfs
  - Approximately 7,000 acres of adjacent floodplain connected at 16,000 cfs
  - Approximately 3,000 acres of adjacent floodplain connected at 14,000 cfs
  - Only a few hundred acres of adjacent floodplain connected at 8,000 cfs flow
- Provides some restriction on storage when basin inflows are 23,000 cfs or less to provide for gradual reductions for flows on the river of 16,000 cfs or less

	January	February	March		April		May		June	July	August	September	October	November	December	Totals
Average	27213	33238	40638		34143		21680		16637	17316	15115	12327	12416	13343	20083	
Minimum	5980	8280	8260		7010		5210		4540	4530	4430	4530	5010	3900	5150	
Maximum	165000	127000	291000		158000		126000		71300	203000	60800	65900	86800	102000	137000	
99.9% exceedence	6163	8378	8298		7082		5404		4580	4578	4498	4671	5080	4160	5393	
99% exceedence	6785	8980	11386		9661		6939		5076	5367	4689	5461	5290	5280	6252	
95% exceedence	9700	11600	13600		12200		8883		7470	7205	5953	6120	5690	5730	7350	
90% exceedence	11600	13700	16500		14400		10400		8660	8620	7900	6910	6307	6460	8800	
80% exceedence	13600	17800	20300		17700		12600		10500	10100	9542	8480	7604	8110	9952	
75% exceedence	15000	19700	22000		18700		13400		11500	11000	10500	9000	8300	8688	10700	
50% exceedence	22200	28400	33400		27800		18000		14600	14000	13500	11350	10800	11200	14900	
25% exceedence	34275	43575	50400		41300		25100		19300	18900	17400	14000	13500	15200	23900	
10% exceedence	51300	58390	69900		64400		37280		27200	26800	24240	18500	19300	21400	40330	
1% exceedence	78532	94219	160280		124000		72914		47682	79328	43428	31800	44847	44744	73856	
			MARCH DAYS	%	APRIL DAYS	%	MAY DAYS	%								
Less than 4000	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	3	0	
Less than 5000	0	0	0	0%	0	0%	0	0%	23	11	33	6	0	7	0	80
Less than 14000	527	240	134	6%	201	9%	668	28%	1013	1188	1301	1731	1895	1651	1077	11626
Less than 14970	600	304	184	8%	257	11%	791	33%	1207	1326	1496	1851	1978	1740	1214	12949
Less than 16000	684	347	210	9%	315	14%	899	38%	1353	1488	1648	1943	2043	1807	1330	14068
Less than 17000	790	387	259	11%	400	17%	1034	43%	1472	1603	1756	1999	2091	1893	1421	15106
Less than 18000	894	450	310	13%	491	21%	1188	50%	1599	1705	1833	2041	2133	1948	1499	16092
Less than 21000	1137	645	533	22%	778	34%	1529	64%	1865	1939	2029	2173	2225	2086	1676	18616
Total Days	2418	2182	2387		2310		2387		2310	2387	2387	2310	2418	2340	2418	

Volatility	
1928-1952 Average Day	1515.544264
1953-2006 Average Day	1923.89668

Average Monthly Flows for Jun-Aug are approximately 16,000 cfs




Jim Woodruff Outflow Based on Basin Inflow
IOP June- Feb; Non-Spawning Period
5000
8000
23000
5000
BI
70 % of BI not less than 8000
16000
Reservoir storage occurs below this line
Minimum Woodruff Outflow (cfs)
Basin Inflow (cfs)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
16000 Target
100% of BI

Interim Plan for March - May

Based on Basin Inflows (BI)

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI >20,400 and < 37,400 cfs, outflow $\geq$ 20,400 cfs and at least 70% of BI
- If BI $\leq$ 20,400 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

Original Interim Plan for Jun – Feb*

- If BI $\geq$ 37,400 cfs, Woodruff outflow $\geq$ 37,400 cfs
- If BI >8,000 and < 37,400 cfs, outflow > 8,000 cfs and at least 70% of BI
- If BI $\leq$ 8,000 cfs, outflow = BI
- Outflow $\geq$ 5,000 cfs

*The Interim Plan was Modified in 12 Jun 06 letter to USFWS

Adjusted Interim Plan Jun – Feb*

- If BI ≥ 23,000 cfs, Woodruff outflow ≥ 16,000 cfs
- If BI >8,000 and < 23,000 cfs, outflow > 8,000 cfs and at least 70% of BI
- If BI ≤ 8,000 cfs, outflow = BI
- Outflow ≥ 5,000 cfs

*The Adjusted Interim Plan was submitted in 12 Jun 06 letter to USFWS; Allows for more opportunities for storage during significant rain events while still providing for mussel and host fish needs

Original Interim Plan Ramping Rates

- Exceeds Powerhouse Capacity (18,000 cfs)

  0.5 to 1.0 ft/ day*

- Within Powerhouse Capacity and >8,000 cfs

  0.25 to 0.5 ft/day*

- Within Powerhouse Capacity and ≤8,000 cfs

  0.25 ft/day or less*

*Consistent with safety requirements, flood control operations, and equipment constraints – Ramping rates for flood control purposes were clarified in the 12 June 2006 letter to USFWS

Adjusted Ramping Rates*

- No ramping when flows are 30,000 cfs or higher
- Ramp down between 1.0 and 2.0 ft/day when flows are between 20,000 cfs and 30,000 cfs
- Ramp down between 0.5 and 1.0 ft/day when flows are between 16,000 cfs and 20,000 cfs
- Ramp down between 0.25 and 0.5 ft/day when flows are between 8,000 cfs and 16,000 cfs
- Ramp down at 0.25 ft/day or less when flows are less than 8,000 cfs

*Adjusted rates submitted in 12 Jun 06 letter to USFWS

U.S Army Corps of Engineers, Mobile District
Interim Operations at Jim Woodruff Dam
and Releases to the Apalachicola River
In Support of Listed Mussels and Gulf Sturgeon

Minimum Releases

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
March - May	>= 37,400	not less than 37,400	Max. known flow of sturgeon spawning in the Apalachicola, as documented in 2005. All of rock shoal inundated by more than 4.59 ft. Majority of floodplain aquatic habitat (61%) in which mussel fish hosts may spawn is connected to the main channel. Peak flows of this magnitude or greater have occurred in all but 5 out of 85 years of record. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 20,400 and < 37,400	>= 70% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases of at least 70% BI would still provide inundation of at least approximately 87% of the rock ledge habitat and access for spawning (>4.59 ft depth) would be available to approximately 60% of the rock ledge habitat at NM 105.
	< 20,400	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Months	Basin Inflow (BI) (cfs)	Releases from JWLD (cfs)	Justification
June - February	>= 23,000	not less than 16,000	A flow of 16,000 cfs is equivalent to the approximate average monthly flow levels for June – August. The 16,000 cfs flow is important because data indicate that it will provide sufficient flow for host fish necessary for mussel reproduction, as well as provide connectivity between the main channel of the Apalachicola River and back channel and floodplain habitat areas used by mussel host fish as well as young Gulf Sturgeon. At this flow level there are still approximately 7,000 acres of floodplain habitat connected to the river channel. The 16,000 cfs release is equivalent to 70 percent of a basin inflow of 23,000 cfs. There is no flow restriction for excess BI above 23,000 cfs, which allows for storage of the excess flow. This additional storage could be used for other project purposes or as future augmentation flows in support of listed mussels. No evidence of adverse effects to listed species if Corps stores BI above this level in these months while observing down ramping rates.
	>= 8,000 and < 23,000	>= 70% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would not significantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (in order to store some water from rain events) in order to allow some refill for future augmentation flows. Releases of at least 70% BI and gradual ramping rates would minimize impacts to host fish necessary for mussel reproduction, by maintaining access to remaining off channel habitat areas. Water stored during these conditions would potentially be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
	< 8,000	>= BI; not less than 5,000	No discretionary action except flow augmentation and ramping rates. 5000 cfs is the minimum condition to ensure using water stored during discretionary actions in other flow ranges and time periods.

Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~16,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less, but not greater than 1.0 ft/day whenever flows are less than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions. For flows between 20,000 cfs and 30,000 cfs, ramping down from flood peaks for flood control purposes would likely be within a range of 1.0 to 2.0 ft/day.**
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cabablities.
**For flows greater than 30,000 cfs, it is not reasonable or prudent to attempt to control down ramping rate, and no ramping rate is required.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS has recommended the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 16,000 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a minimum percentage of 70 BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% BI release would assure that at least approximately 60% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on spawning habitat or host fish habitat requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

Status – 12 July 06

- 13 June 06 - USFWS requested 45-day extension to complete BO
- 21 June 06 - Georgia filed TRO requesting no more than 5,000 cfs release
- 21 June 06 - Florida filed TRO requesting 8,000 cfs min. flow
- 22 June 06 - Court granted FL TRO requiring 8,000 cfs release
- 23 June, 26 June, 27 June, 29 June 06 - Court revised FL TRO to ramp down to 7,000 cfs, 6750 cfs, 6250 cfs and 6,000 cfs respectively
  - ramping rate of no more than 0.25 ft/day;
  - pending further modification if agreement can be reached between States

Status – 12 July 06

- 30 June 06 – Interim agreement reached between AL, FL, GA and Dept of Army until 24 July 06
  - 5,000 cfs min. flow with augmentation from "Environmental Storage Pool" as requested by FL
  - Environmental Storage Pool equivalent to 5 percent composite storage in ACF basin
  - Cumulative withdrawals/deposits to the Environmental Storage Pool posted on Mobile District Water Management Web Page
- FWS and Corps continue to consult on impacts of the Adjusted IOP on Gulf sturgeon and mussels
- Corps agreed to 45-day Extension of Consultation Period - Biological Opinion due by 5 September 2006

Jim Woodruff Dam

Lessons Learned

Basis for Revised IOP

Hydrological Modeling Technical Workshop II

12 July 2006

ESA-listed species on Apalachicola River

Gulf sturgeon

Fat threeridge

Purple bankclimber

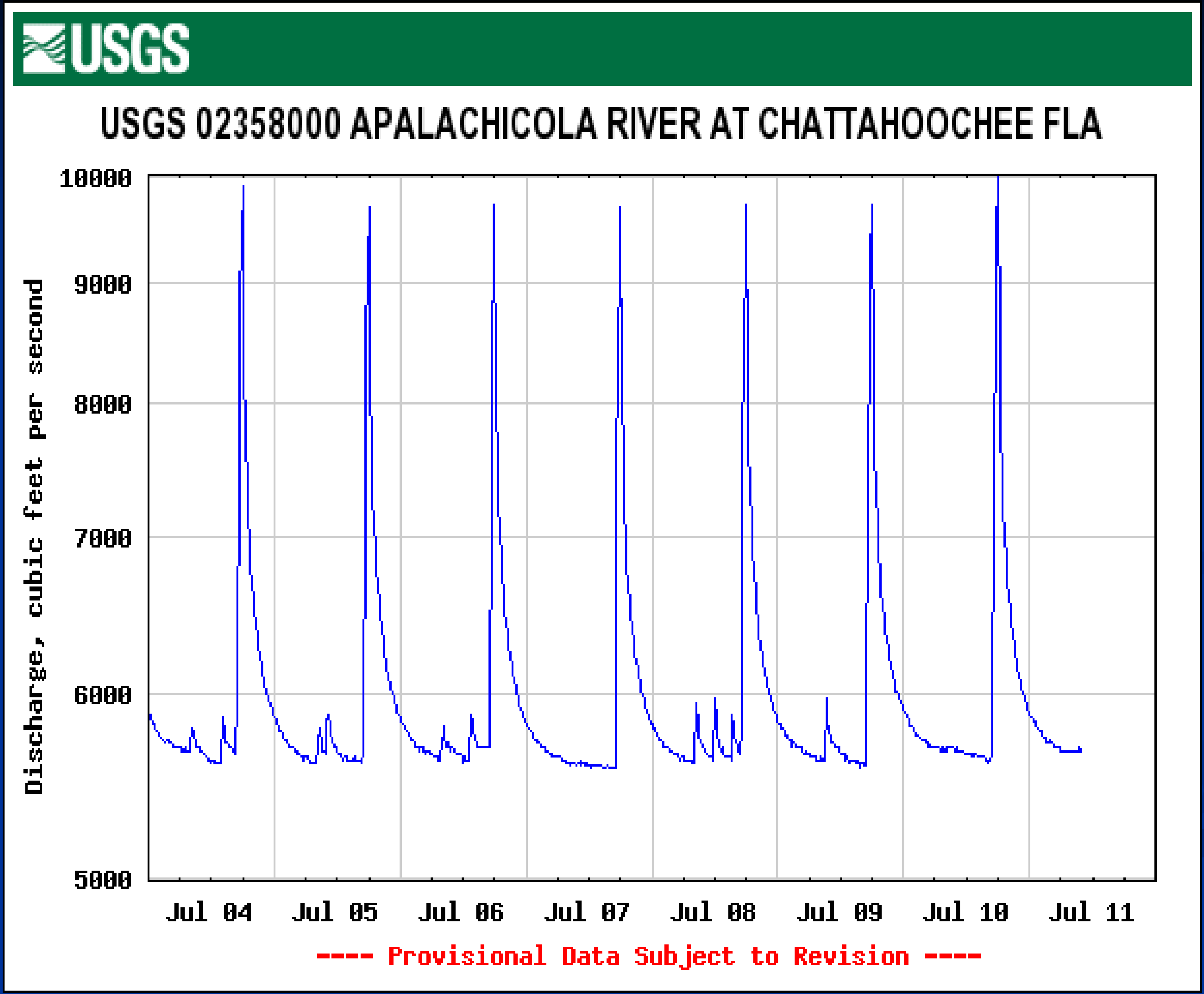
Adjustments to IOP Submitted to USFWS on 12 June 2006

Based on "Lessons Learned"

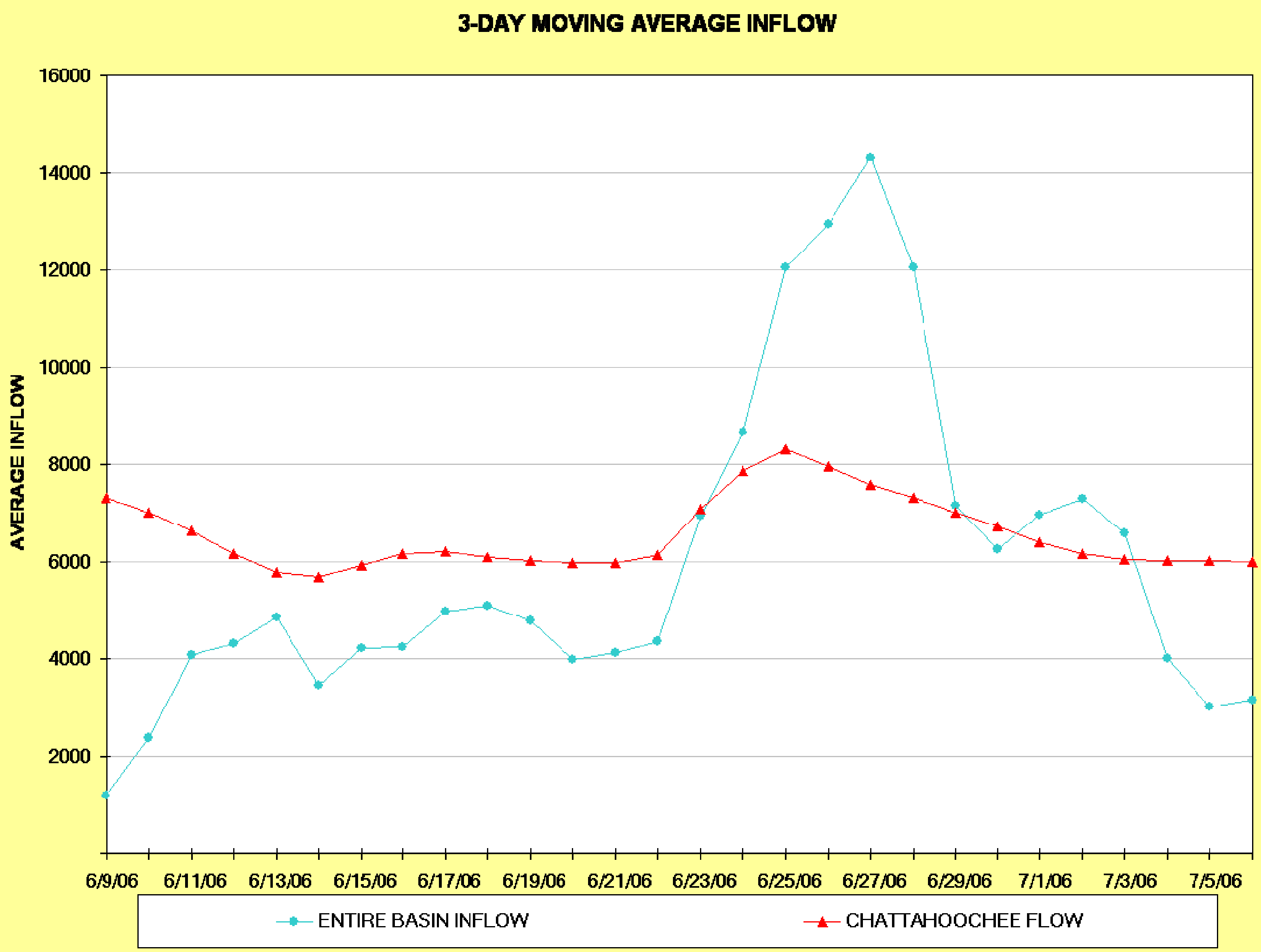
1. Use Chattahoochee gage, 7-day average and volume computations to measure Basin Inflow and Releases to smooth releases and minimize over-releases
2. Include "mini-peaking" operations at JWD
3. Adjust upper flow threshold Jun-Feb to provide for more opportunities for storage
4. Clarify flood control flows and ramping rates

1. Use of Chattahoochee Gage

- Documented variation in flows between USGS Chattahoochee gage number 02358000 and Jim Woodruff Outflow
- May be result of differences in spillway and turbine ratings, as well as other flow movements beneath the dam
- Chattahoochee gage is universally accepted point-of-measurement; part of Unimpaired Flow Data Set

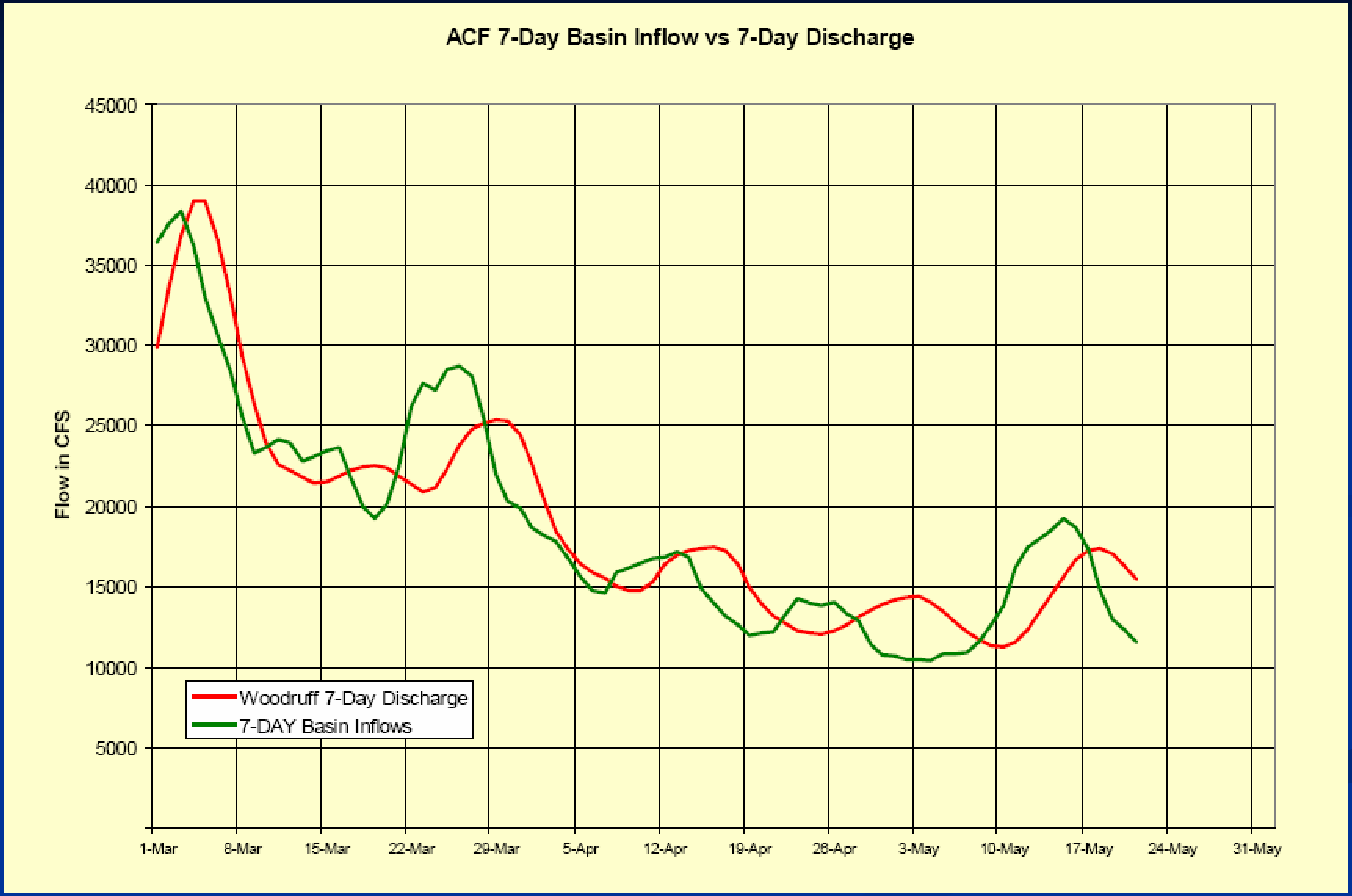


USGS
USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA
Discharge, cubic feet per second
10000
9000
8000
7000
6000
5000
Jul 04
Jul 05
Jul 06
Jul 07
Jul 08
Jul 09
Jul 10
Jul 11
---- Provisional Data Subject to Revision ----


3-DAY MOVING AVERAGE INFLOW
AVERAGE INFLOW
16000
14000
12000
10000
8000
6000
4000
2000
6/9/06
6/11/06
6/13/06
6/15/06
6/17/06
6/19/06
6/21/06
6/23/06
6/25/06
6/27/06
6/29/06
7/1/06
7/3/06
7/5/06
ENTIRE BASIN INFLOW
CHATTAHOOCHEE FLOW

1. 7-Day Average Inflows

- As much as 7-10 day lag for rain in upper basin to reach Jim Woodruff
- Difficult to predict basin response to rainfalls of short durations and intensities
- Allows for smoother transitions of releases
- Better prediction of when to begin ramp down
- Minimize use of storage



ACF 7-Day Basin Inflow vs 7-Day Discharge
Flow in CFS
45000
40000
35000
30000
25000
20000
15000
10000
5000
1-Mar
8-Mar
15-Mar
22-Mar
29-Mar
5-Apr
12-Apr
19-Apr
26-Apr
3-May
10-May
17-May
24-May
31-May
Woodruff 7-Day Discharge
7-DAY Basin Inflows

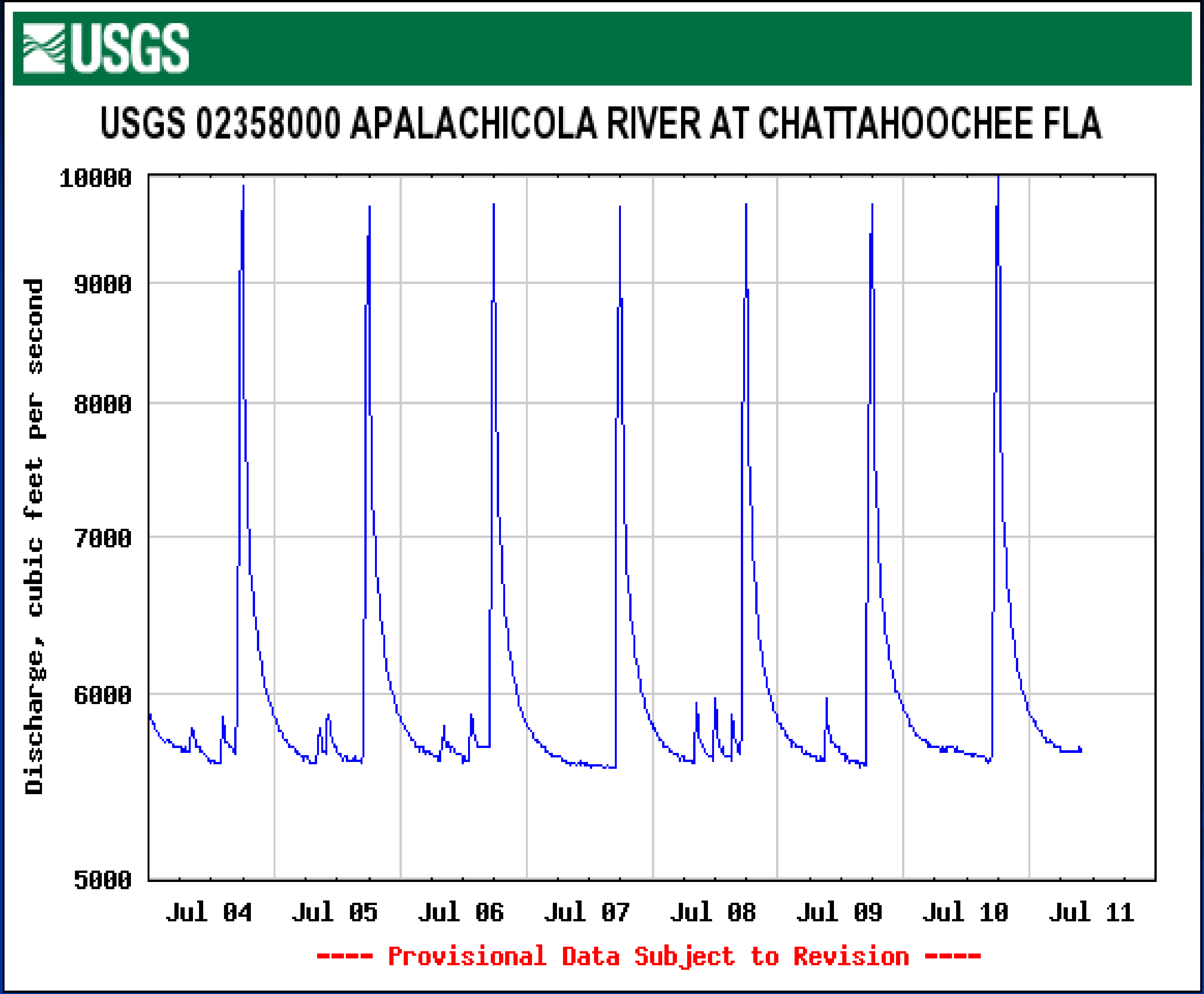
1. Volume Computations

- Better for species:
  - Maintain a steady flow for longer periods vs. numerous fluctuations in attempt to match BI
  - Ramp down rates perhaps more critical
- Maintain continuous record of BI vs. Releases
- Temporary Imbalance? Periodic adjustments
- Greater than 5% - Readjust flows consistent with other features of IOP

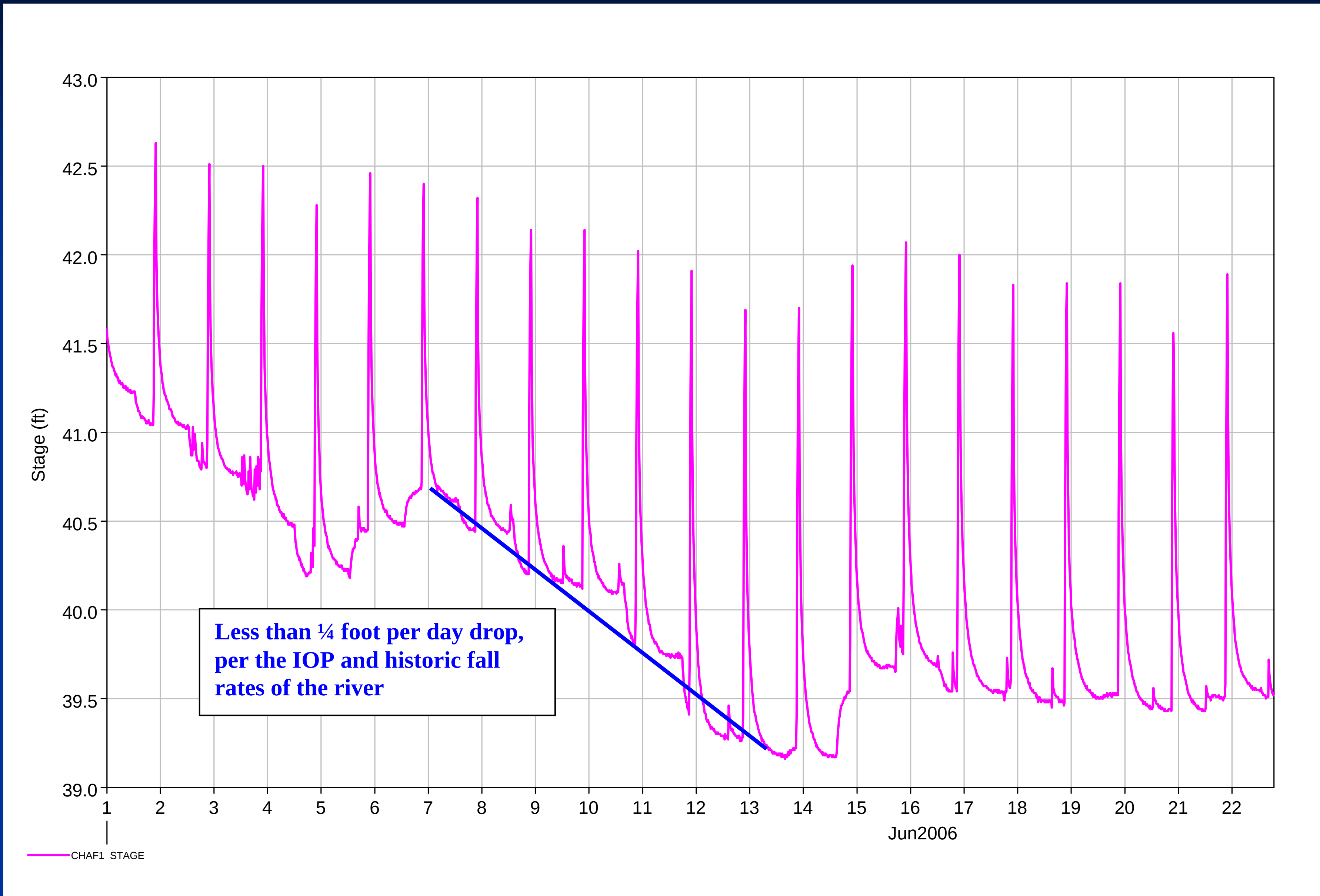
DATE	Inflow Volume	Outflow Volume	Difference
3/1/2006			
3/2/2006			
3/3/2006			
3/4/2006			
3/5/2006			
3/6/2006	1,965,369,600	2,308,233,600	342,864,000
3/7/2006	1,984,608,000	2,135,433,600	150,825,600
3/8/2006	1,788,249,600	2,093,472,000	305,222,400
3/9/2006	1,617,177,600	1,938,585,600	321,408,000
3/10/2006	2,070,374,400	1,803,139,200	-267,235,200
3/11/2006	2,501,856,000	1,775,145,600	-726,710,400
3/12/2006	2,541,686,400	1,817,452,800	-724,233,600
3/13/2006	1,976,601,600	1,877,097,600	-99,504,000
3/14/2006	1,479,456,000	1,912,636,800	433,180,800
3/15/2006	1,486,972,800	1,942,675,200	455,702,400
3/16/2006	1,595,001,600	1,955,232,000	360,230,400
3/17/2006	1,724,572,800	1,958,774,400	234,201,600
3/18/2006	1,556,064,000	1,961,049,600	404,985,600

2. Hydropower Peaking

- Required to meet SEPA Contract requirements
- One hour of generation at peak plant capacity each day
- Outflows for remainder of day adjusted to insure mean daily flow target met
- During ramp down, mean daily water surface elevations at Chattahoochee gage used

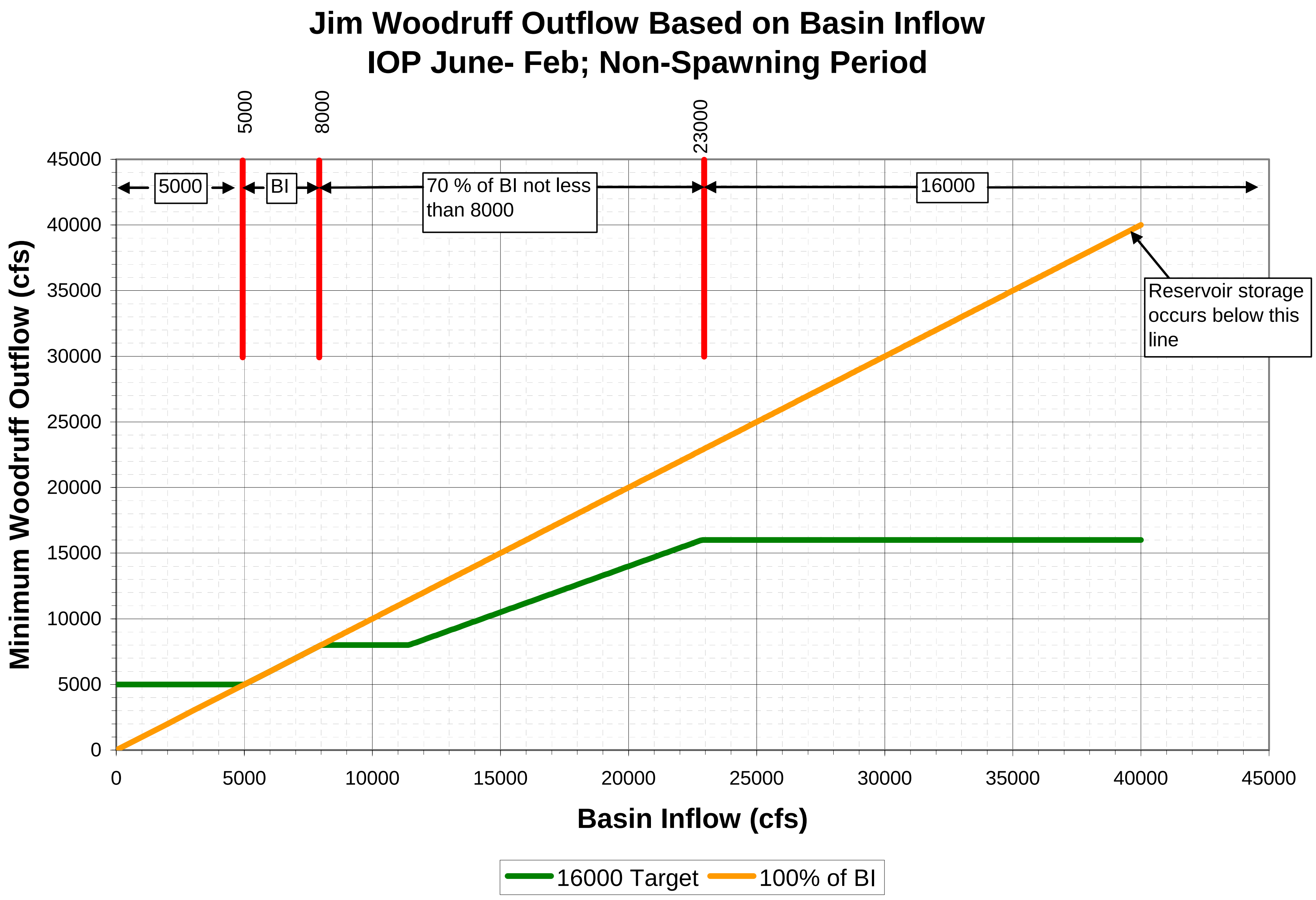


USGS
USGS 02358000 APALACHICOLA RIVER AT CHATTAHOOCHEE FLA
Discharge, cubic feet per second
10000
9000
8000
7000
6000
5000
Jul 04
Jul 05
Jul 06
Jul 07
Jul 08
Jul 09
Jul 10
Jul 11
---- Provisional Data Subject to Revision ----


43.0
42.5
42.0
41.5
41.0
40.5
40.0
39.5
39.0
Stage (ft)
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22
Jun2006
Less than ¼ foot per day drop, per the IOP and historic fall rates of the river
CHAF1 STAGE

3. Proposed Adjustment to Jun-Feb Upper Threshold

- Intent to provide sufficient flows when available for access to the adjacent floodplain by host fish for mussels
- Average monthly flows for Jun – Aug approximately 16,000 cfs
  - Approximately 7,000 acres of adjacent floodplain connected at 16,000 cfs
  - Approximately 3,000 acres of adjacent floodplain connected at 14,000 cfs
  - Only a few hundred acres of adjacent floodplain connected at 8,000 cfs flow
- Provides some restriction on storage when basin inflows are 23,000 cfs or less to provide for gradual reductions for flows on the river of 16,000 cfs or less


Jim Woodruff Outflow Based on Basin Inflow
IOP June- Feb; Non-Spawning Period
5000
8000
23000
5000
BI
70 % of BI not less than 8000
16000
Reservoir storage occurs below this line
Minimum Woodruff Outflow (cfs)
Basin Inflow (cfs)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
16000 Target
100% of BI

	January	February	March	April	May	June	July	August	September	October	November	December	Totals
Average	27213	33238	40638	34143	21680	16637	17316	15115	12327	12416	13343	20083	
Minimum	5980	8280	8260	7010	5210	4540	4530	4430	4530	5010	3900	5150	
Maximum	165000	127000	291000	158000	126000	71300	203000	60800	65900	86800	102000	137000	
99.9% exceedence	6163	8378	8298	7082	5404	4580	4578	4498	4671	5080	4160	5393	
99% exceedence	6785	8980	11386	9661	6939	5076	5367	4689	5461	5290	5280	6252	
95% exceedence	9700	11600	13600	12200	8883	7470	7205	5953	6120	5690	5730	7350	
90% exceedence	11600	13700	16500	14400	10400	8660	8620	7900	6910	6307	6460	8800	
80% exceedence	13600	17800	20300	17700	12600	10500	10100	9542	8480	7604	8110	9952	
75% exceedence	15000	19700	22000	18700	13400	11500	11000	10500	9000	8300	8688	10700	
50% exceedence	22200	28400	33400	27800	18000	14600	14000	13500	11350	10800	11200	14900	
25% exceedence	34275	43575	50400	41300	25100	19300	18900	17400	14000	13500	15200	23900	
10% exceedence	51300	58390	69900	64400	37280	27200	26800	24240	18500	19300	21400	40330	
1% exceedence	78532	94219	160280	124000	72914	47682	79328	43428	31800	44847	44744	73856	

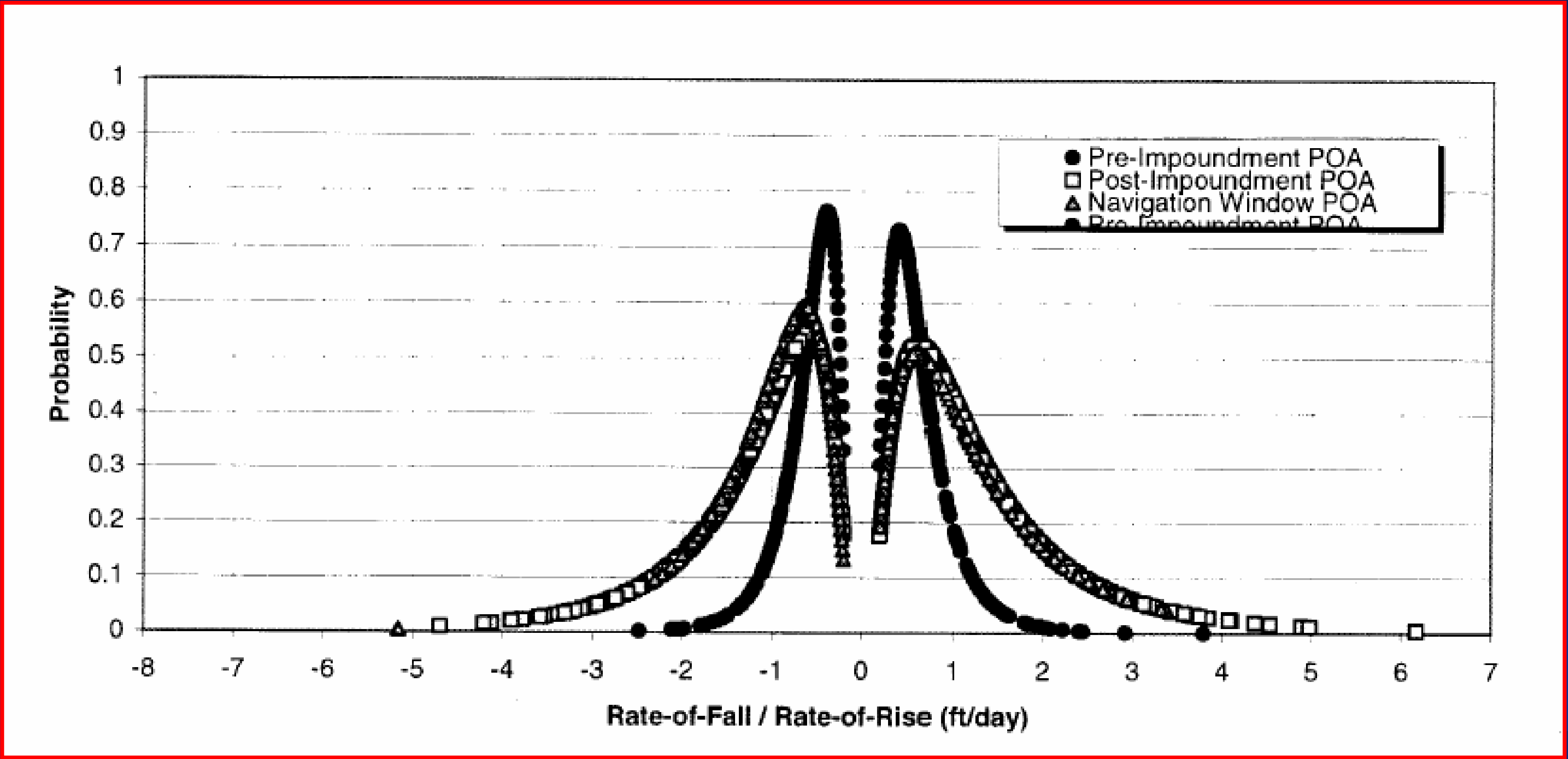
			MARCH DAYS	%	APRIL DAYS	%	MAY DAYS	%								
Less than 4000	0	0	0	0%	0	0%	0	0%	0	0	0	0	0	3	0	
Less than 5000	0	0	0	0%	0	0%	0	0%	23	11	33	6	0	7	0	80
Less than 14000	527	240	134	6%	201	9%	668	28%	1013	1188	1301	1731	1895	1651	1077	11626
Less than 14970	600	304	184	8%	257	11%	791	33%	1207	1326	1496	1851	1978	1740	1214	12949
Less than 16000	684	347	210	9%	315	14%	899	38%	1353	1488	1648	1943	2043	1807	1330	14068
Less than 17000	790	387	259	11%	400	17%	1034	43%	1472	1603	1756	1999	2091	1893	1421	15106
Less than 18000	894	450	310	13%	491	21%	1188	50%	1599	1705	1833	2041	2133	1948	1499	16092
Less than 21000	1137	645	533	22%	778	34%	1529	64%	1865	1939	2029	2173	2225	2086	1676	18616
Total Days	2418	2182	2387		2310		2387		2310	2387	2387	2310	2418	2340	2418	

Volatility	
1928-1952 Average Day	1515.544264
1953-2006 Average Day	1923.89668

4. Ramping Rates

- Propose to release less than peak, and then match volumes on ramp down – goal of only 100% of Basin Inflow
- Change to 16,000 cfs powerhouse capacity
- Changes for flood control operations

Historical Rate-of-Fall Rates



Original Interim Plan Ramping Rates

- Exceeds Powerhouse Capacity (18,000 cfs)
  - 0.5 to 1.0 ft/ day*
- Within Powerhouse Capacity and >8,000 cfs
  - 0.25 to 0.5 ft/day*
- Within Powerhouse Capacity and $\leq$8,000 cfs
  - 0.25 ft/day or less*

*Consistent with safety requirements, flood control operations, and equipment constraints – Ramping rates for flood control purposes were clarified in the 12 June 2006 letter to USFWS

Adjusted Ramping Rates*

- No ramping when flows are 30,000 cfs or higher
- Ramp down between 1.0 and 2.0 ft/day when flows are between 20,000 cfs and 30,000 cfs
- Ramp down between 0.5 and 1.0 ft/day when flows are between 16,000 cfs and 20,000 cfs
- Ramp down between 0.25 and 0.5 ft/day when flows are between 8,000 cfs and 16,000 cfs
- Ramp down at 0.25 ft/day or less when flows are less than 8,000 cfs

*Adjusted rates submitted in 12 Jun 06 letter to USFWS

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and Releases to the Apalachicola River
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	>= 20,400 and < 37,400	>= 70% BI; not less than 20,400	In 2005 successful sturgeon spawning was documented to occur between 20,400 cfs and 37,400 cfs. All of rock shoal habitat at NM 105 is inundated in this range, and most (>73%) innundated with > 4.59 ft (the min. reported depth of Gulf sturgeon spawning in any river). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would insignificantly affect the area of the rock shoal inundated or other characteristics that may influence its suitability as spawning habitat. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% in order to all some refill for future augmentation flows. Releases of at least 70% BI would still provide inundation of at least approximately 87% of the rock ledge habitat and access for spawning (>4.59 ft depth) would be available to approximately 60% of the rock ledge habitat at NM 105.
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	>= 8,000 and < 23,000	>= 70% BI; not less than 8,000	Max. known stage of listed mussels on the river bed (8000 cfs). Storing up to 30% of BI (i.e., releasing >= 70% BI) in this flow range would not significantly effect habitat features relevant to sturgeon and mussel conservation in these months while observing down ramping rates. No mussels would be exposed. During normal to wet periods releases would likely equal or exceed 90% BI. During extended dry or drought periods, if composite storage is less than full, it may be prudent to release less than 90% (in order to store some water from rain events) in order to allow some refill for future augmentation flows. Releases of at least 70% BI and gradual ramping rates would minimize impacts to host fish necessary for mussel reproduction, by maintaining access to remaining off channel habitat areas. Water stored during these conditions would potentially be available for future augmentation to maintain flows above BI when 8000 cfs >BI >= 5000 cfs, and above 5000 cfs when BI < 5000 cfs.
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Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day), measured at Chattahoochee gage	Justification
Exceeds Powerhouse Capacity* (~16,000 cfs)	0.5 to 1.0 ft/day	Apalachicola River fall rates of greater than 0.5 ft/day were extremely rare prior to construction of the Corps ACF projects (analysis of gage records from the 1920s to present), except during flood pulses. Mussels and early sturgeon life stages have limited mobility to avoid stranding. The Corps ability to control fall rates at less than 0.5 ft/day when releases exceed the powerhouse capacity is very limited, but the stranding risk to listed species at these high flows is also limited (e.g., all of the known sturgeon spawning rock shoal is inundated by flows greater than 18,000 cfs). Previous operations have attempted to produce a fall rate of 0.5 ft/day or less, but not greater than 1.0 ft/day whenever flows are less than 20,000 cfs. These rates represent the best attempt within current capabilities to limit stranding risks of other species in the floodplain, such as potential mussel host fishes. Rates will approximate 0.5 ft/day, but not more than 1 ft/day except in emergency conditions. For flows between 20,000 cfs and 30,000 cfs, ramping down from flood peaks for flood control purposes would likely be within a range of 1.0 to 2.0 ft/day.**
Within Powerhouse Capacity and > 8,000 cfs*	0.25 to 0.5 ft/day	More gradual (lesser) fall rates become a greater conservation concern at flows that approach the stages at which the mussels are found and are achievable when releases are from the powerhouse instead of the spillway gates. 8,000 cfs is the highest stage at which the listed mussels are found. Fall rates of approximately 0.25 ft/day in advance of this stage gives mussels several days to move to lower bed elevations. 9,000 cfs provides approximately 0.5 ft or greater above the highest-stage listed mussels.
Within Powerhouse Capacity and <=8,000 cfs*	0.25 ft/day or less	8,000 cfs is the highest stage at which the listed mussels are found and when the most gradual rates are required if flows decline further. Fall rates of approximately 0.25 ft/day give the mussels several days to move to lower elevations. Rates of less than 0.25 ft/day may be possible when making releases from the powerhouse, but are more difficult to achieve (incremental reduction in releases of 500 cfs/day approximates 0.25 ft/day). Previous operations have been in range of 0.25 and 0.5 ft/day during sustained low flow periods. These rates appear to be within the tolerance of the two species ability to move to lower stages. It is supported mainly by the fact that they are present at stages above 5000 cfs after several years of flows hovering around 5,000 cfs for extended periods during the drought of 1998-2002.

*Consistent with safety requirements, flood control purposes, equipment cababilities.
**For flows greater than 30,000 cfs, it is not reasonable or prudent to attempt to control down ramping rate, and no ramping rate is required.

Note: These operations are considered sufficient to minimize adverse effects on the listed species to the maximum extent practicable or feasible based on equipment constraints, and safety concerns. Consideration is also given to the need to balance releases to the river with the need to refill or conserve storage in upstream reservoirs in the interest of having adequate storage in later months when augmentation flows may be necessary to protect listed mussel species. Any of the numbers in this table are subject to revision based on better information that may be developed during the Section 7 consultation process. FWS has recommended the release of 90% of BI as the degree to which the Corps could store water during intermediate flow ranges (i.e., March through May when BI is between 37,400 cfs and 20,400 cfs; and June through February when BI is less than 16,000 cfs and greater than 8,000 cfs) such that the amount of flow depletion would not measurably alter habitat quality features in those flow ranges (e.g., temperature, DO, channel area inundated, etc.). Although this requirement can be met during normal to wet periods, it may not be reasonable or prudent during extended dry or drought periods. Therefore, the Corps proposes a minimum percentage of 70 BI that would be released during extended dry or drought periods. The goal would be to release 90% BI. In the event this was not feasible or prudent (i.e. would prevent sufficient refill or conservation of storage to guarantee future augmentation flows for mussels or to meet other critical project purpose needs), then informal consultation discussions would be conducted with FWS to determine the appropriate percentage release and the justification for the reduced percentage release. The release to the Apalachicola River would be at least 70% BI. The 70% BI release would assure that at least approximately 60% of the rock ledge spawning habitat at NM 105 would be submerged to a depth of 4.59 ft or greater during spawning periods during these intermediate flows during this discretionary action. No mussels would be exposed during these intermediate flows due to discretionary action. Any reduction in releases would represent a trade-off of minimal impact on spawning habitat or host fish habitat requirements in order to provide future augmentation flows as required to prevent or minimize mussel mortality due to exposure.

HEC-5 Modeling of ACF Interim Operation by Mobile District

July 12, 2006

Model Settings

- Demands
  - Hydropower
    - Schedule based most recent operation
  - Water Supply
    - 2001 actual net for Chattahoochee and Flint Basins
    - 1993 actual net for Apalachicola River
  - Agricultural
    - Flint River provided by FWS STELLA modeling
    - Chattahoochee and Apalachicola 2000 projected
  - Required Flow
    - Atlanta
    - Columbus
    - Jim Woodruff Outflow; spawn and non-spawning season
- Operation
  - Balanced 4 federal reservoirs
  - Based on Comp Study Black & White model
  - Down Ramping Rate Restriction

Changes to B&W Model

- JW
  - Increased outlet capacity at elevation 75 (8600 to 18600)
  - Increase storage for Zone 4 (76.5 to 76.74); results in WF George sending water earlier for balancing Zone 4
- WF George
  - Added hydropower demand on weekend to assist with balance releases (PD)
- System
  - Removed equivalent level for reservoir balancing (J2.4)
  - Recycle through solution twice (J2.4)

Hydropower Demand

- Hydropower demand is a function of available storage. As the storage diminishes the demand reduces. Storage Zones described in the ACF Water Control manual dated 1989 used as the bases to assign the hydropower demand. Values developed from examining hydropower generation over the last few years.

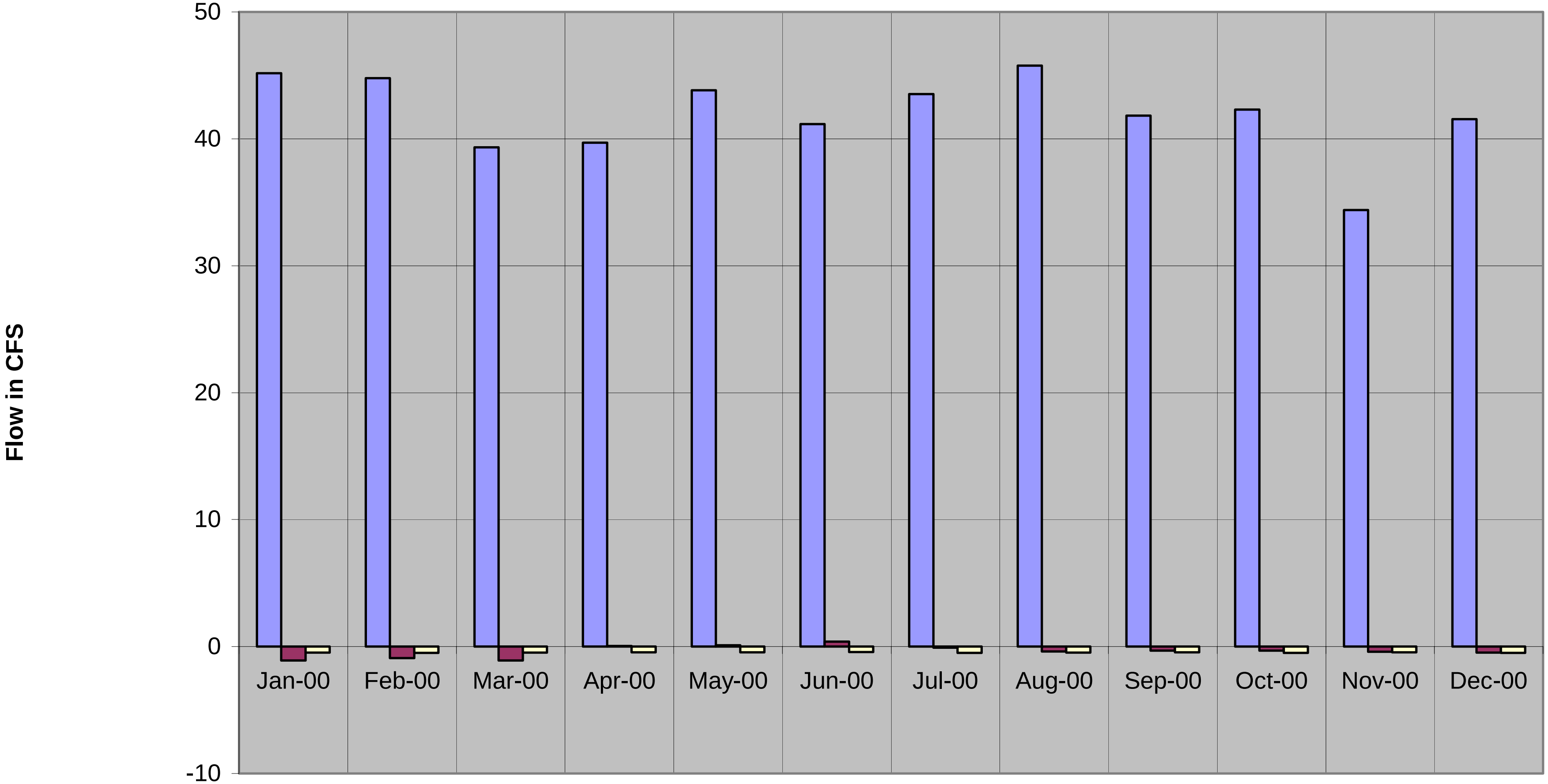
IOP Model	Buford	West Point	WF George
Zone	(hours use)	(hours use)	(hours use)
1	3	4	4
2	2	2	2
3	2	2	2
4	0	0	0

Water Supply

- The actual 2000 net water use provided by the states Georgia and Alabama used as the municipal and industrial demand for the Chattahoochee and Flint basin. The actual 1993 net water used for the Apalachicola River.

Water Supply-Apalachicola

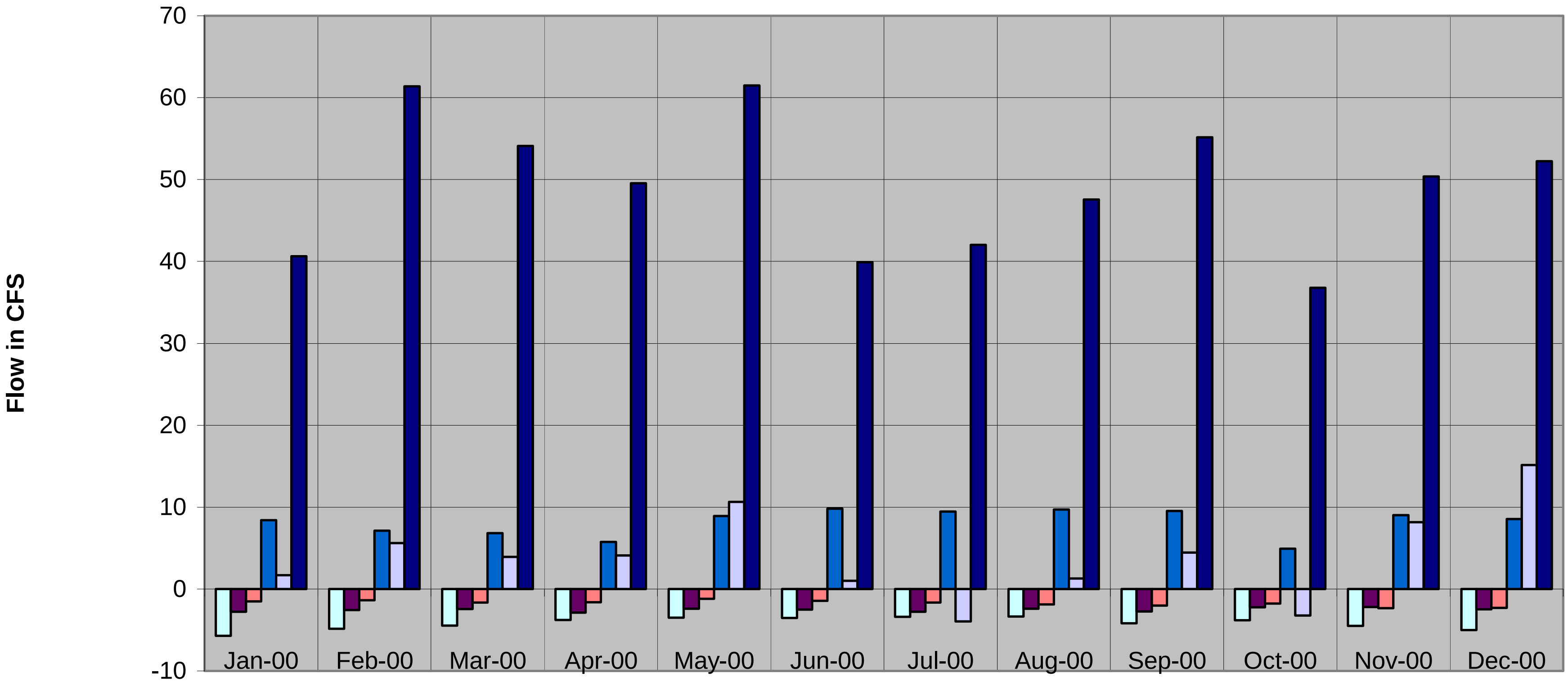
Apalachicola River Net M&I Demand



	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
Sumatra	45.18	44.78	39.34	39.7	43.83	41.17	43.53	45.76	41.82	42.31	34.38	41.56
Blountstown	-1.09	-0.92	-1.09	0.05	0.09	0.39	-0.09	-0.39	-0.32	-0.31	-0.4	-0.47
Chattahoochee	-0.47	-0.5	-0.48	-0.46	-0.46	-0.43	-0.5	-0.47	-0.46	-0.51	-0.46	-0.5

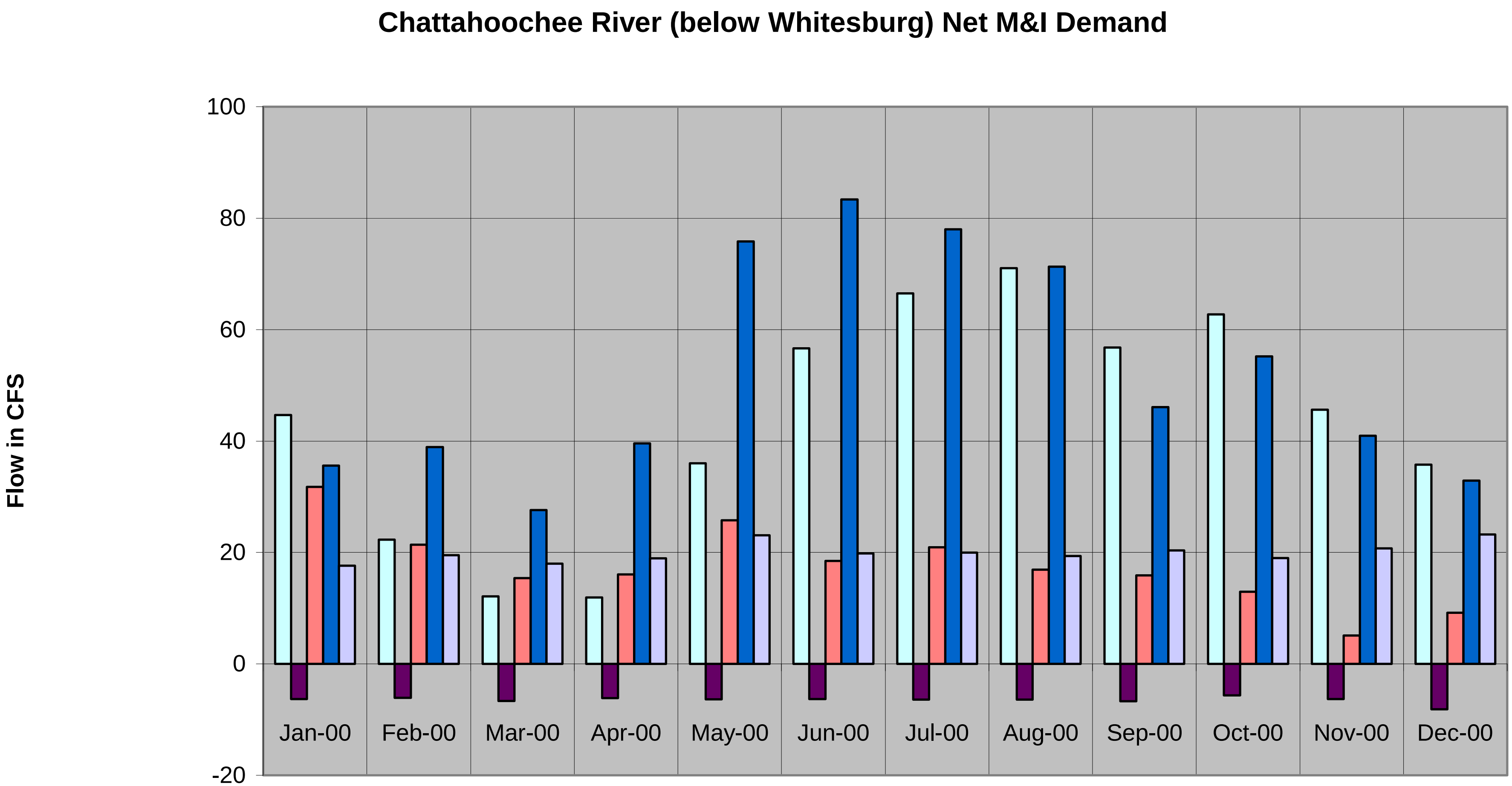
Water Supply-Flint

Flint River Net M&I Demand



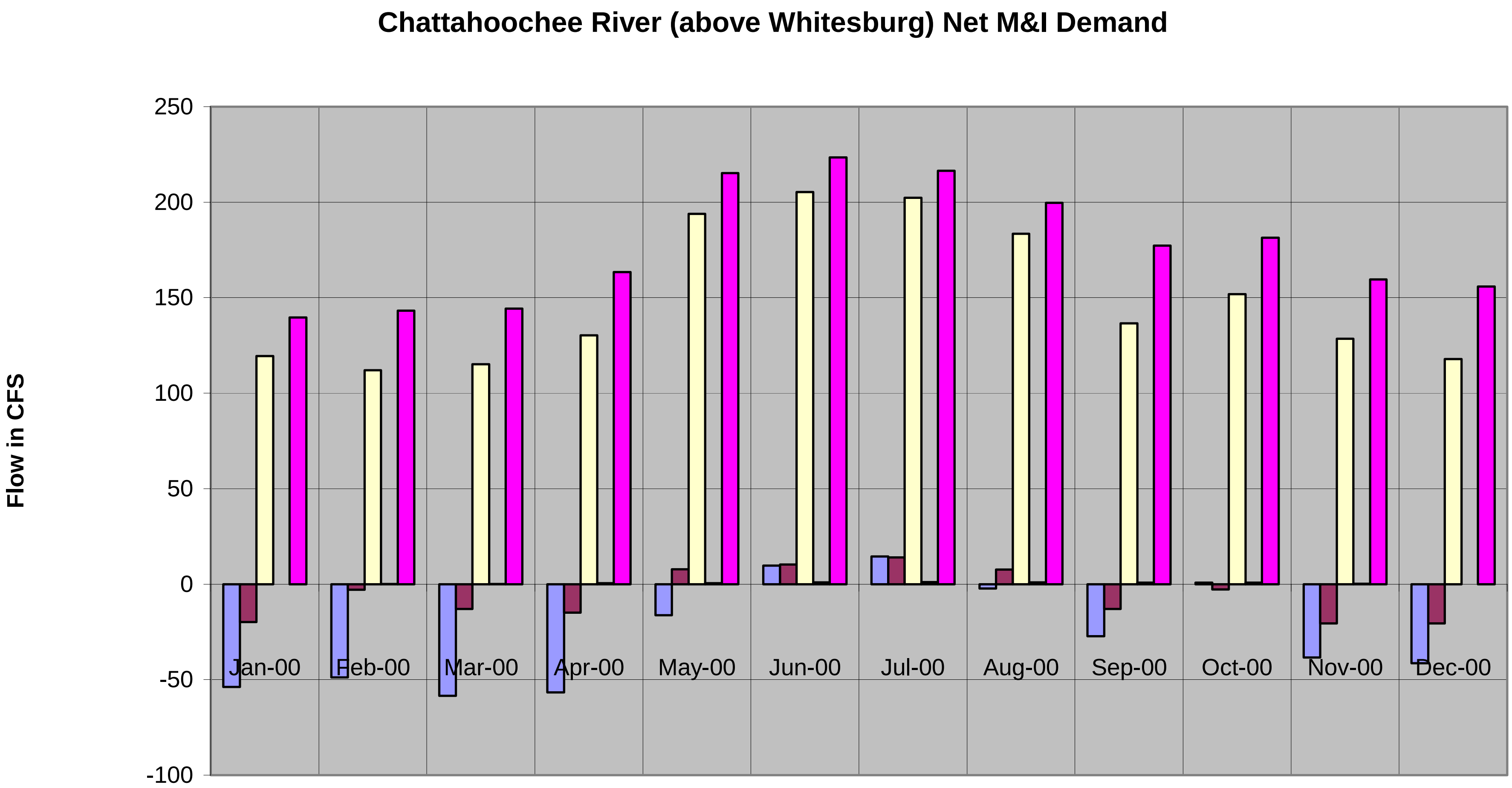
	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
JW Flint	-5.72	-4.87	-4.46	-3.79	-3.51	-3.52	-3.38	-3.36	-4.19	-3.8	-4.49	-5.01
Bainbridge	-2.77	-2.55	-2.44	-2.89	-2.4	-2.52	-2.78	-2.4	-2.72	-2.22	-2.2	-2.49
Newton	-1.53	-1.36	-1.65	-1.61	-1.19	-1.43	-1.66	-1.87	-2.02	-1.76	-2.34	-2.3
Albany	8.41	7.11	6.81	5.75	8.92	9.81	9.45	9.71	9.54	4.91	9.01	8.55
Montezuma	1.68	5.61	3.91	4.11	10.65	1.01	-3.97	1.28	4.45	-3.24	8.15	15.14
Griffin	40.63	61.36	54.1	49.54	61.49	39.9	42.01	47.58	55.15	36.78	50.37	52.24

Water Supply-Chattahoochee below Whitesburg



	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
JW Chattahooche	44.68	22.31	12.11	11.92	36.01	56.63	66.49	71.04	56.76	62.75	45.65	35.76
George Andrews	-6.29	-6.09	-6.67	-6.13	-6.37	-6.3	-6.41	-6.43	-6.73	-5.62	-6.33	-8.12
WF George	31.78	21.37	15.4	16.05	25.75	18.51	20.94	16.93	15.9	12.92	5.12	9.19
Columbus	35.61	38.91	27.59	39.55	75.83	83.33	78.03	71.29	46.08	55.19	40.95	32.88
West Point Dam	17.62	19.49	18	18.95	23.08	19.8	19.97	19.34	20.39	19	20.73	23.2

Water Supply-Chattahoochee above Whitesburg



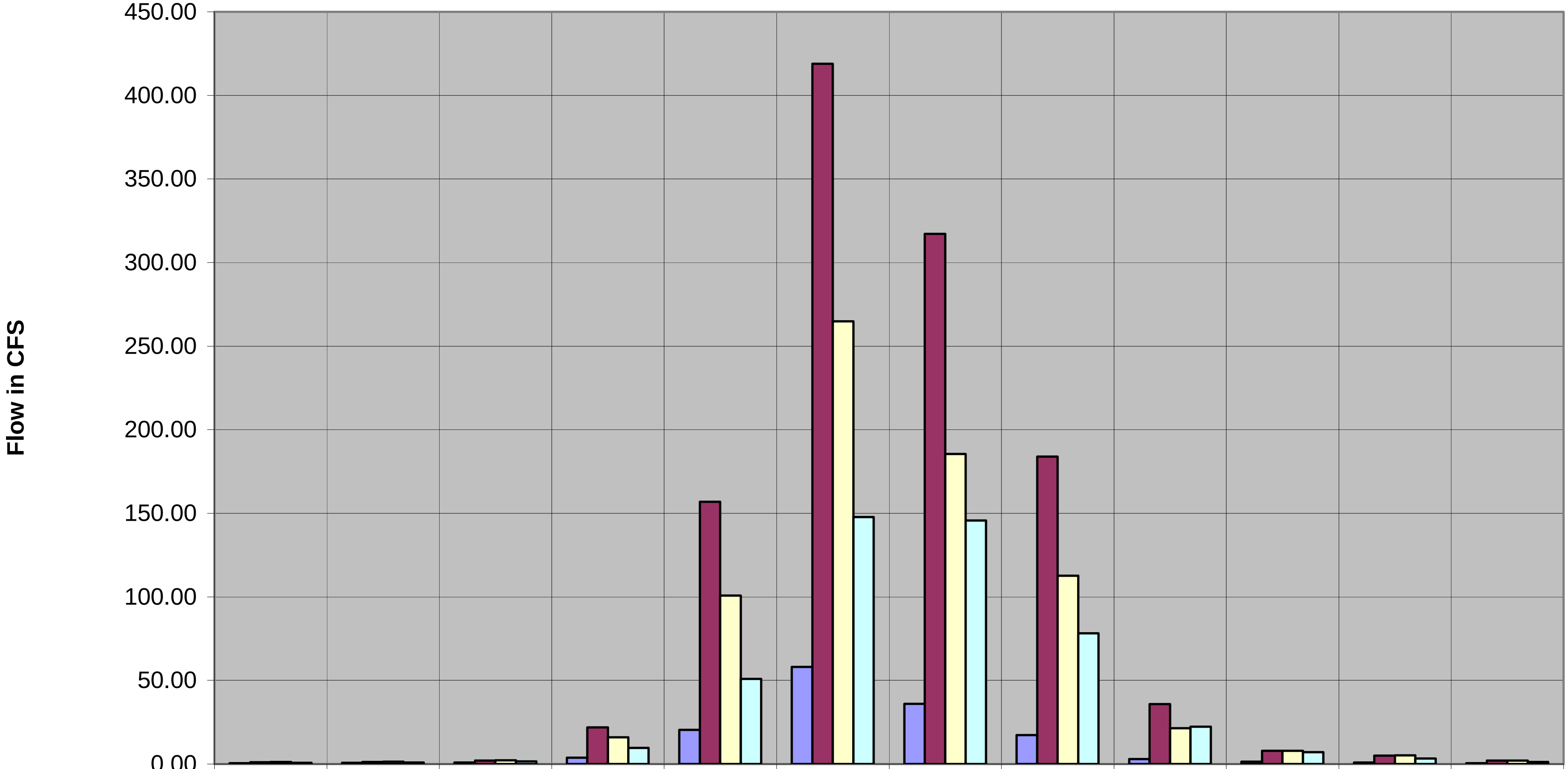
	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
Whiteburg	-53.81	-48.82	-58.48	-56.59	-16.2	9.77	14.54	-2.34	-27.28	0.83	-38.44	-41.41
Atlanta	-19.78	-2.92	-13.02	-14.85	7.77	10.27	13.99	7.61	-12.98	-2.78	-20.53	-20.57
Morgan Falls	119.45	112.11	115.13	130.31	193.83	205.36	202.33	183.54	136.54	151.79	128.53	117.86
Norcross	-0.05	0.03	0.03	0.56	0.48	1	1.11	1.05	0.77	0.79	0.3	-0.01
Buford	139.67	143.27	144.24	163.49	215.21	223.45	216.37	199.63	177.27	181.41	159.6	155.87

Agricultural Demand

- Flint River Ag demands provided by the FWS STELLA model. Acreages equal to 621,000 and dry year multiplier of 1.4.
- Rest of basin based on NRCS year 2000 projected use. Data developed during the ACT/ACF Comprehensive Study.

Ag Demand Flint River (normal year)

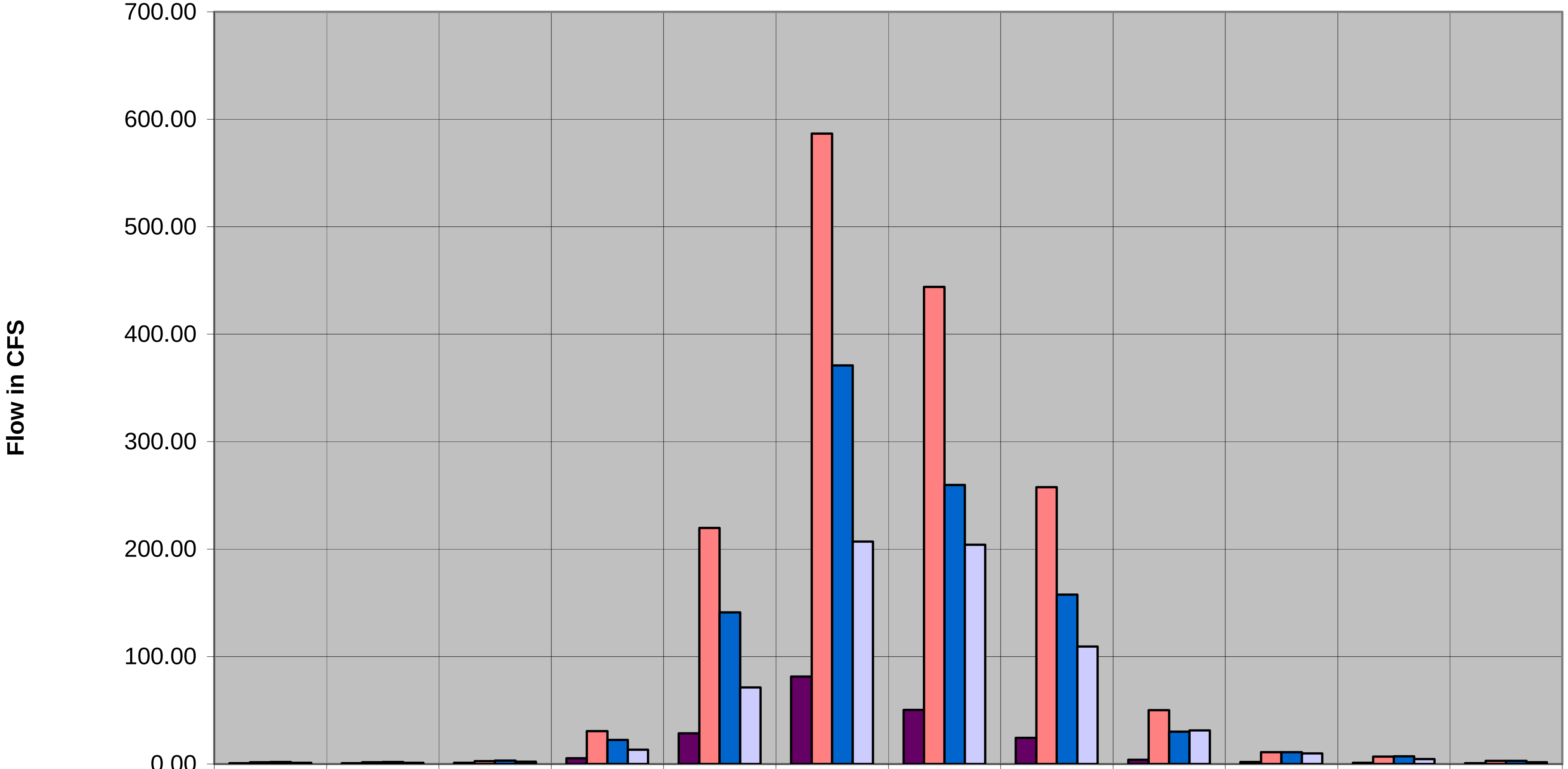
Flint River Ag Demands (Normal Year)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Montezuma	0.60	0.66	0.77	3.81	20.41	58.14	36.01	17.27	2.91	1.31	0.79	0.59
Newton	1.08	1.19	1.98	21.98	156.89	419.03	317.22	184.02	35.85	7.85	4.98	2.02
Bainbridge	1.25	1.38	2.28	16.02	100.79	264.92	185.44	112.66	21.50	7.84	5.10	2.07
Jiw Woodruff	0.72	0.79	1.62	9.54	50.93	147.85	145.70	78.14	22.29	7.08	3.30	1.12

Ag Demand Flint River (dry year)

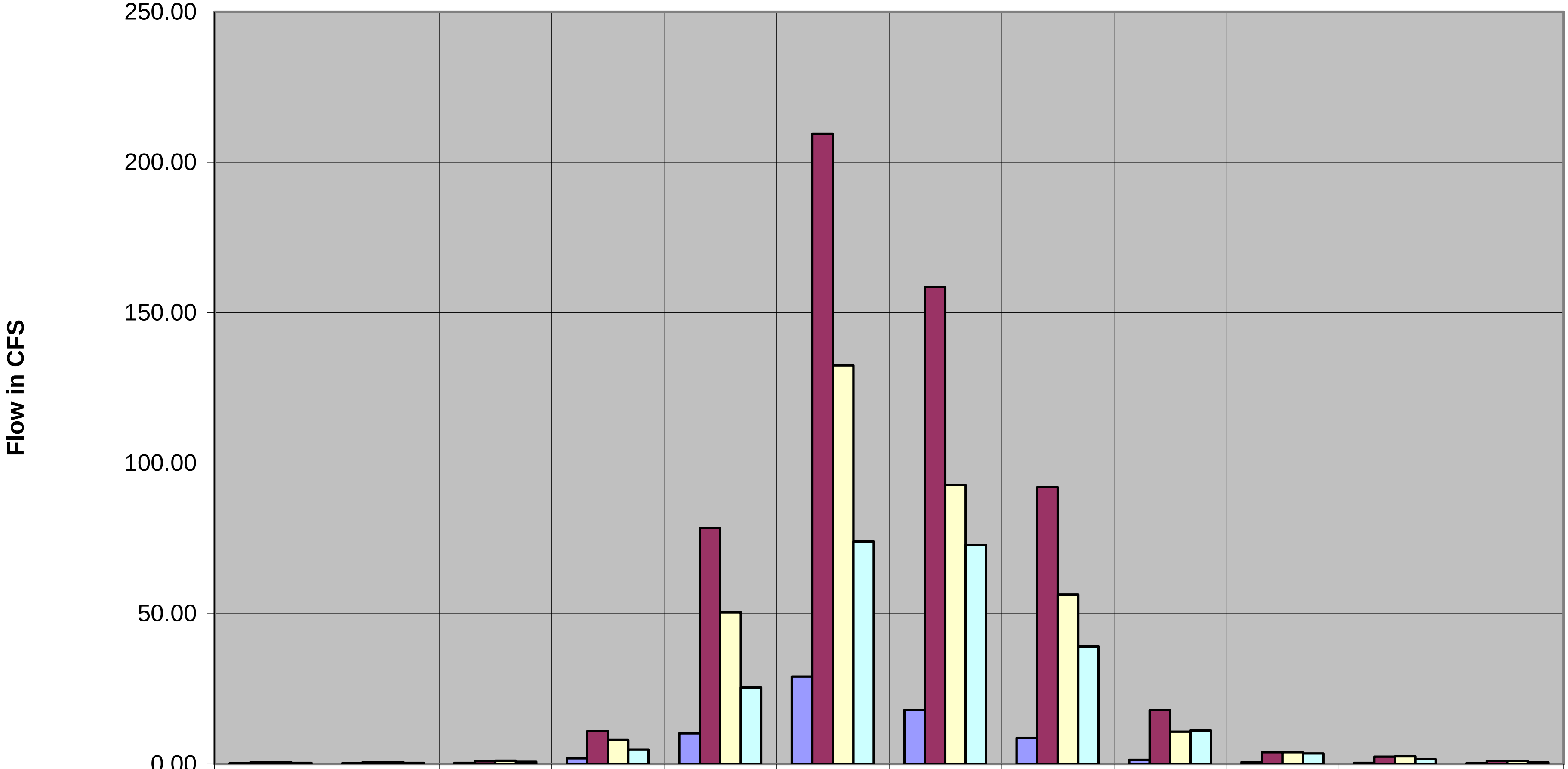
Flint River Ag Demands (Dry Year)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Montezuma	0.84	0.93	1.08	5.34	28.57	81.40	50.41	24.18	4.07	1.84	1.11	0.83
Newton	1.52	1.67	2.77	30.78	219.64	586.64	444.11	257.63	50.19	10.99	6.97	2.83
Bainbridge	1.75	1.94	3.19	22.43	141.10	370.88	259.61	157.72	30.10	10.98	7.15	2.90
Jiw Woodruff	1.01	1.11	2.27	13.36	71.30	207.00	203.98	109.39	31.20	9.92	4.63	1.57

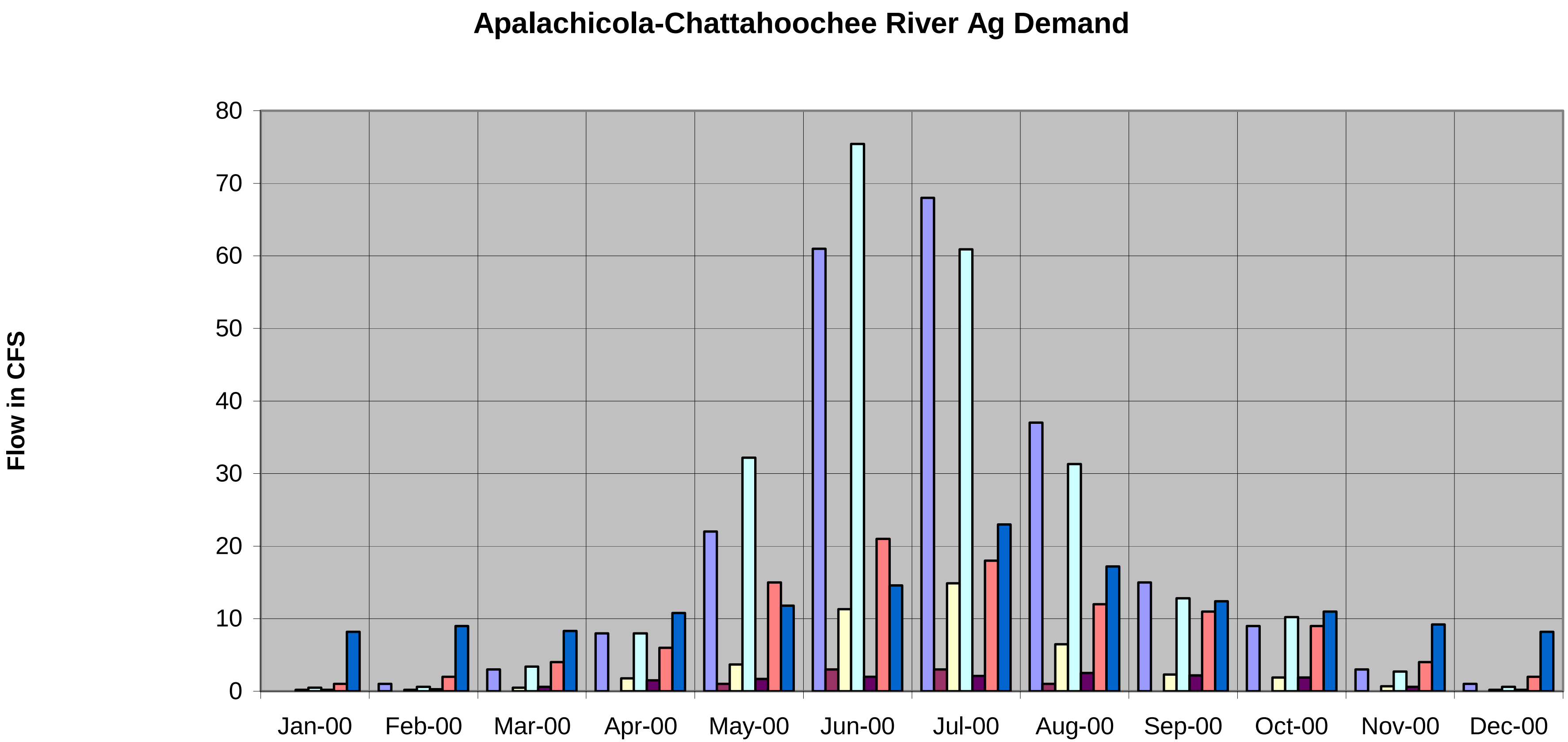
Ag Demand Flint River (wet year)

Flint River Ag Demands (Wet Year)



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Montezuma	0.30	0.33	0.39	1.91	10.20	29.07	18.00	8.64	1.45	0.66	0.40	0.30
Newton	0.54	0.60	0.99	10.99	78.44	209.51	158.61	92.01	17.93	3.93	2.49	1.01
Bainbridge	0.63	0.69	1.14	8.01	50.39	132.46	92.72	56.33	10.75	3.92	2.55	1.03
Jiw Woodruff	0.36	0.40	0.81	4.77	25.47	73.93	72.85	39.07	11.14	3.54	1.65	0.56

Ag Demand Apalachicola-Chattahoochee River



	Jan-00	Feb-00	Mar-00	Apr-00	May-00	Jun-00	Jul-00	Aug-00	Sep-00	Oct-00	Nov-00	Dec-00
Sumatra	0	1	3	8	22	61	68	37	15	9	3	1
Bloutstown	0	0	0	0	1	3	3	1	0	0	0	0
George Andrews	0	0	1	2	4	11	15	7	2	2	1	0
WF George	1	1	3	8	32	75	61	31	13	10	3	1
Columbus	0	0	1	2	2	2	2	3	2	2	1	0
West Point	1	2	4	6	15	21	18	12	11	9	4	2
Buford	8	9	8	11	12	15	23	17	12	11	9	8

Required Flow

- Minimum flow requirement
  - Atlanta 750 cfs
  - Columbus
    - 1,850 cfs if West Point > 621.6
    - 1,200 cfs if West Point < 621.6
- Continuous Release
  - Buford 450 cfs (small unit)
  - West Point 675 cfs (small unit)
  - Jim Woodruff 100 cfs (lockages/leakages)

Jim Woodruff Release

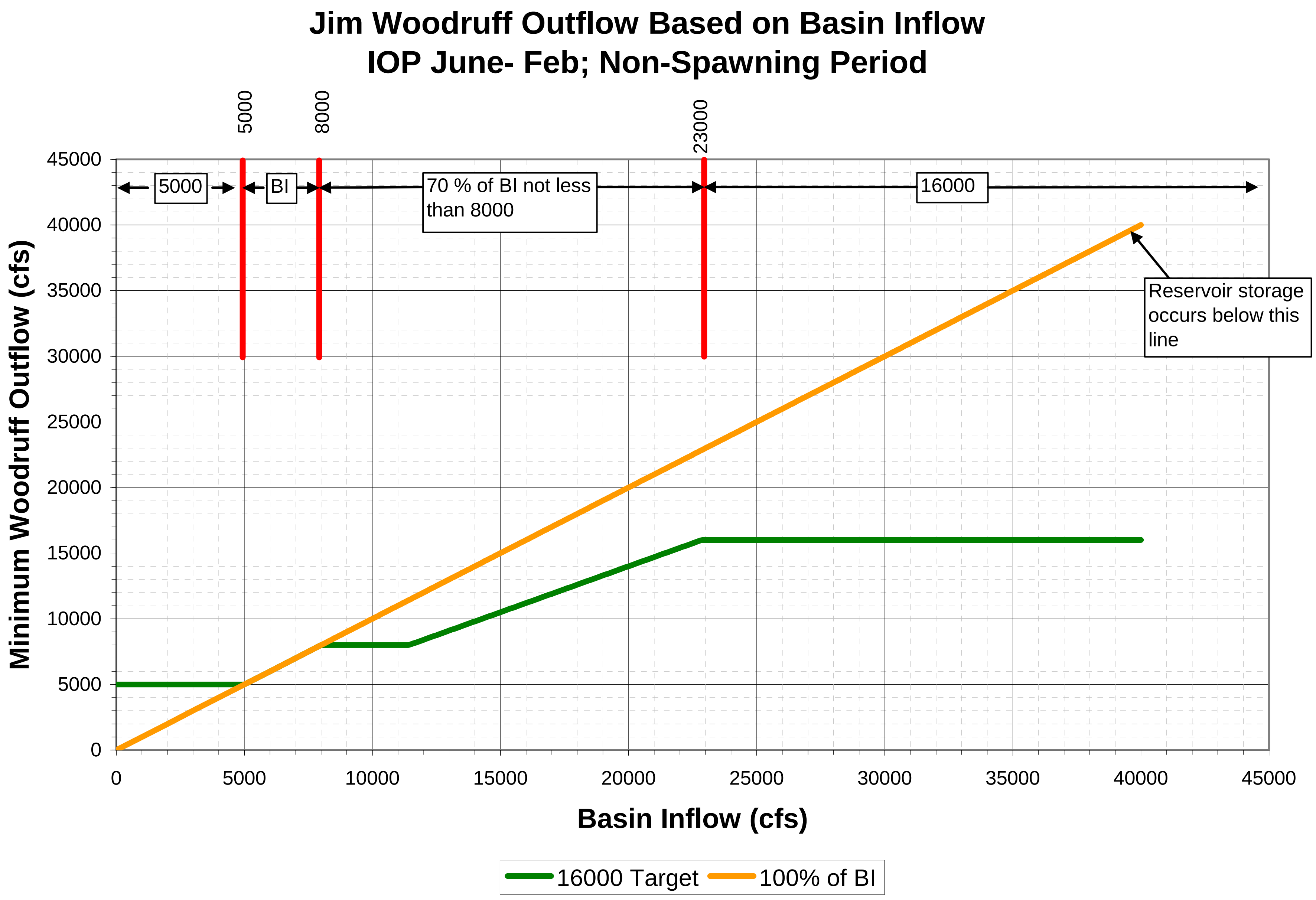
Months	Basin Inflow	Releases from JW
June- February	>= 23,000	not less than 16,000
	>= 8,000 and <23,000	>=70% of BI; but not less than 8,000
	< 8,000	>= BI; not less than 5,000
March - May	>= 37,400	not less than 37,400
	>= 20,400 and <37,000	>=70% of BI; but not less than 20,400
	< 20,400	>= BI; not less than 5,000

Woodruff Required Outflow

- Preprocess Spreadsheet (JWoutflows.xls)
  - Based on Basin Inflows (BI)
    - 7-day moving average
  - 2 Seasons
    - March – May (spawning)
    - June – February
  - Storage Ratio
    - 70% release

JWoutflow.xls

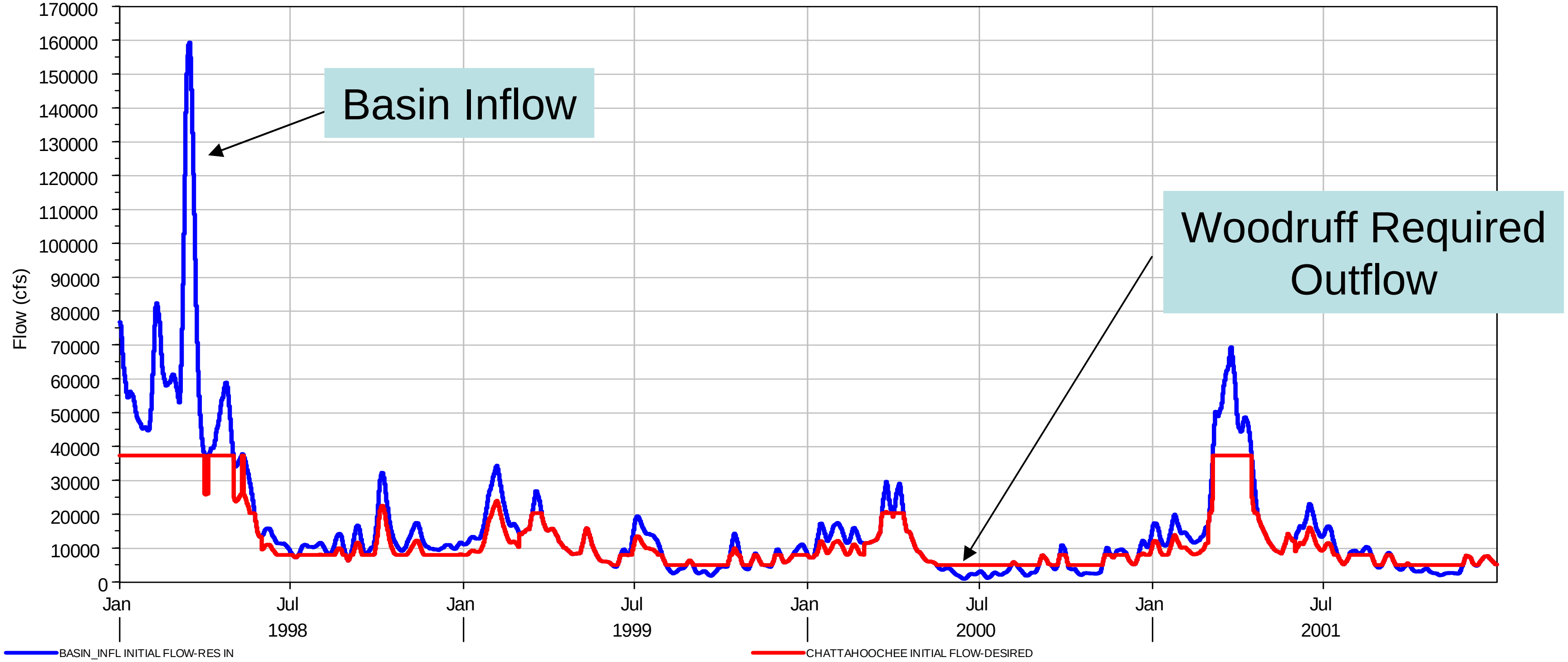
	B	C	D	E	F	G	H
1		APALACHICOLA	BI Limits	Non-Spaw	Spawn		
2		JIM WOODRUFF	Upper	37400	37400		
3		FLOW_CUM	Middle	8000	20400		
4			Lower	5000	5000		
5		1DAY					
6		STELLA-JW 7DA	Storage Ratio	90%			
7		1-Jan-39					
8		2400					
9		31-Dec-01					
10		2400					
11		CFS					
12	**Index**	PER-AVER	Season	BI Bracket	Outflow 1	Outflow 2	Pre Endangered Release
13	01/01/1939	0	Non-Spawn	4	5,000	0	5000
14	01/02/1939	1,112.56	Non-Spawn	4	5,000	0	5000


Jim Woodruff Outflow Based on Basin Inflow
IOP June- Feb; Non-Spawning Period
5000
8000
23000
5000
BI
70 % of BI not less than 8000
16000
Reservoir storage occurs below this line
Minimum Woodruff Outflow (cfs)
Basin Inflow (cfs)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
16000 Target
100% of BI

Jim Woodruff Outflow Based on Basin Inflow
IOP March-May; Spawning Period
5000
20400
37400
5000
BI
70 % of BI not less than 20,400
37400
Reservoir storage occurs below this line
Minimum Woodruff Outflow (cfs)
0
5000
10000
15000
20000
25000
30000
35000
40000
45000
Basin Inflow (cfs)
70% of BI
100% of BI

Woodruff Required Outflow

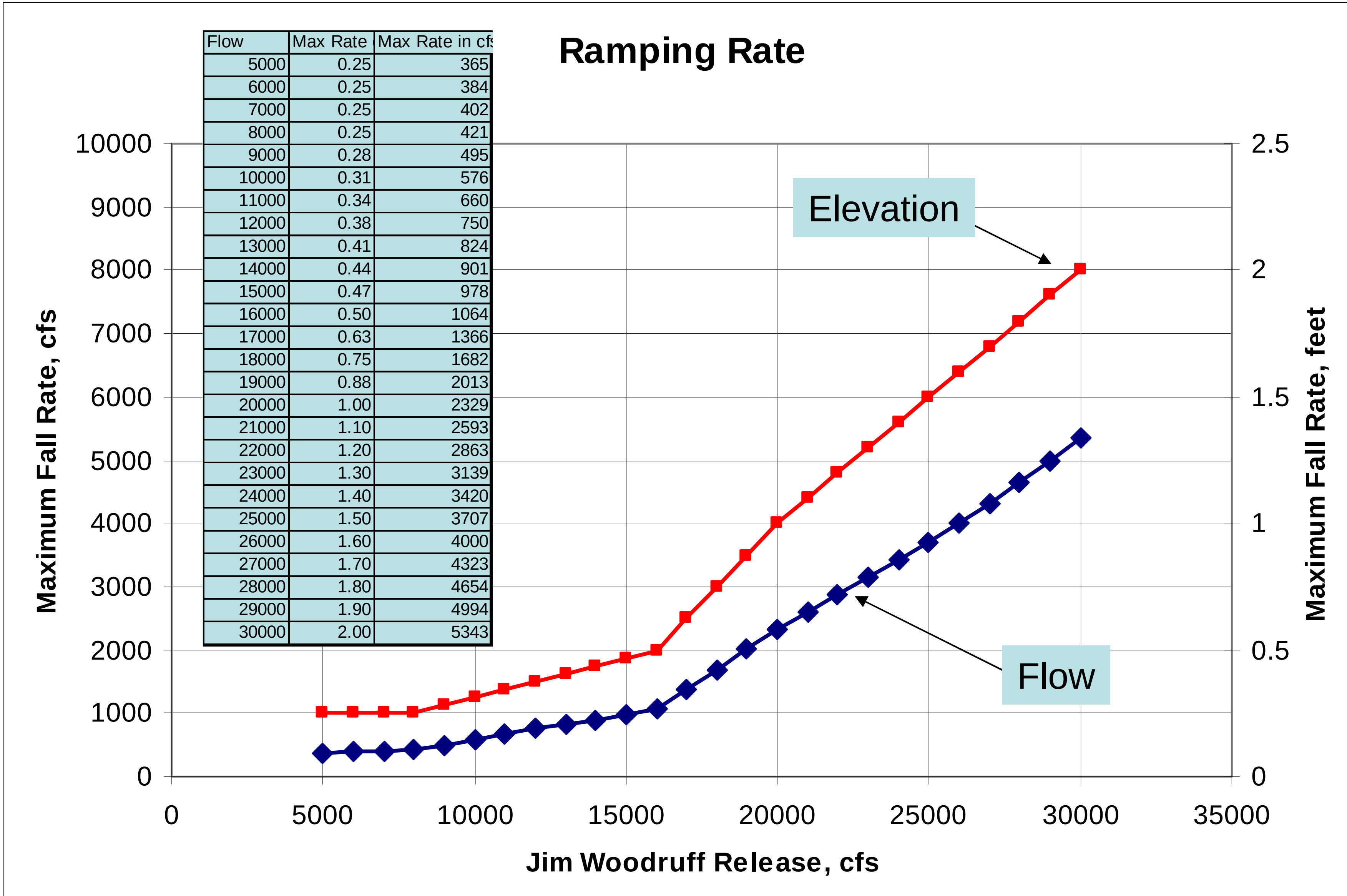
- Values imported to DSS
- HEC-5 Chattahoochee minimum flow requirement



Down Ramping Rates

Release Range	Maximum Fall Rate (ft/day) measurse at Chattahoocee
> 30,000	none
> 20,000 and <= 30,000	1.0 to 2.0
> 16,000 and <= 20,000	0.5 to 1.0
> 8,000 and <= 16,000	0.25 to 0.5
<= 8,000	0.25

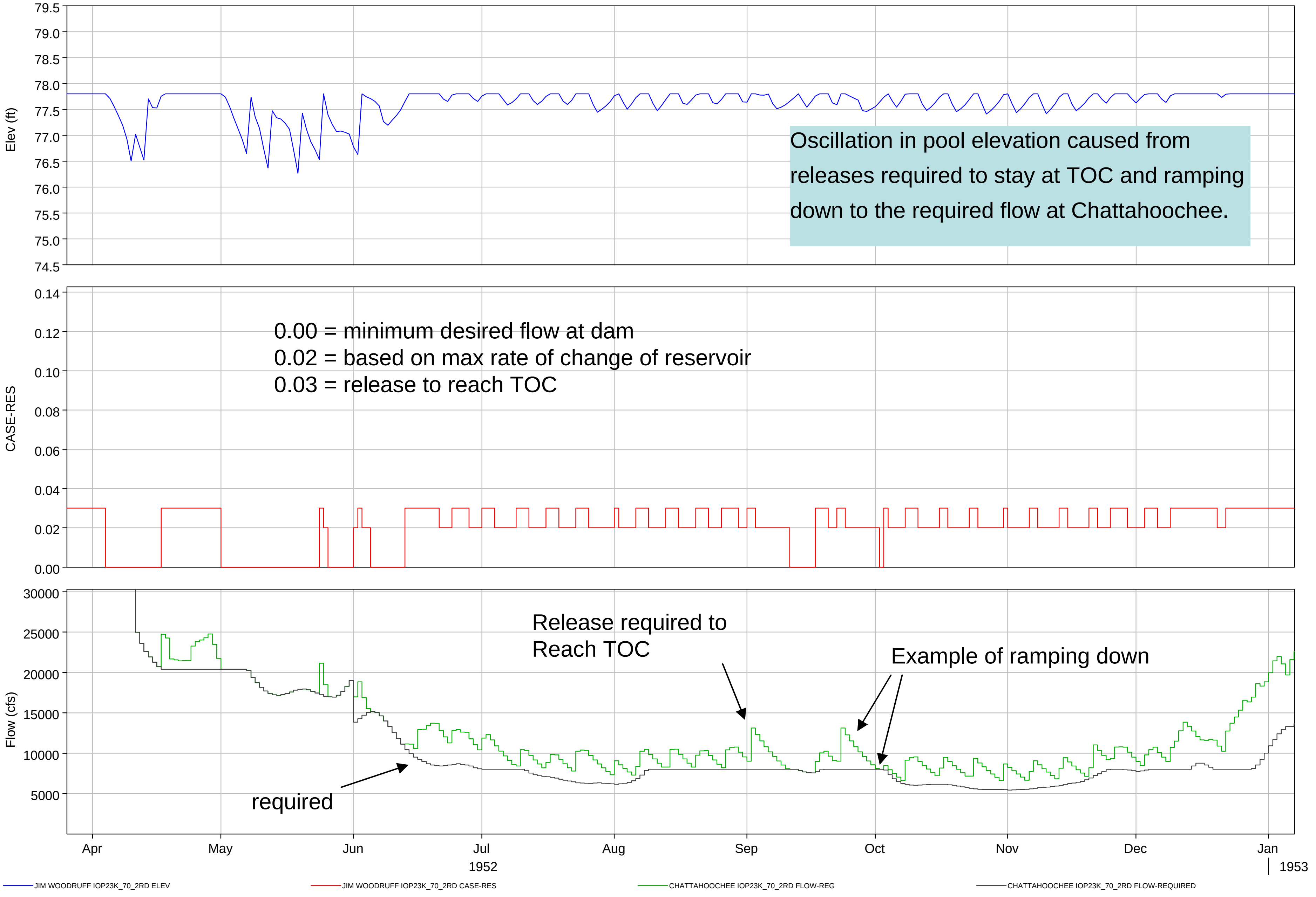
Maximum Fall Rate in Model



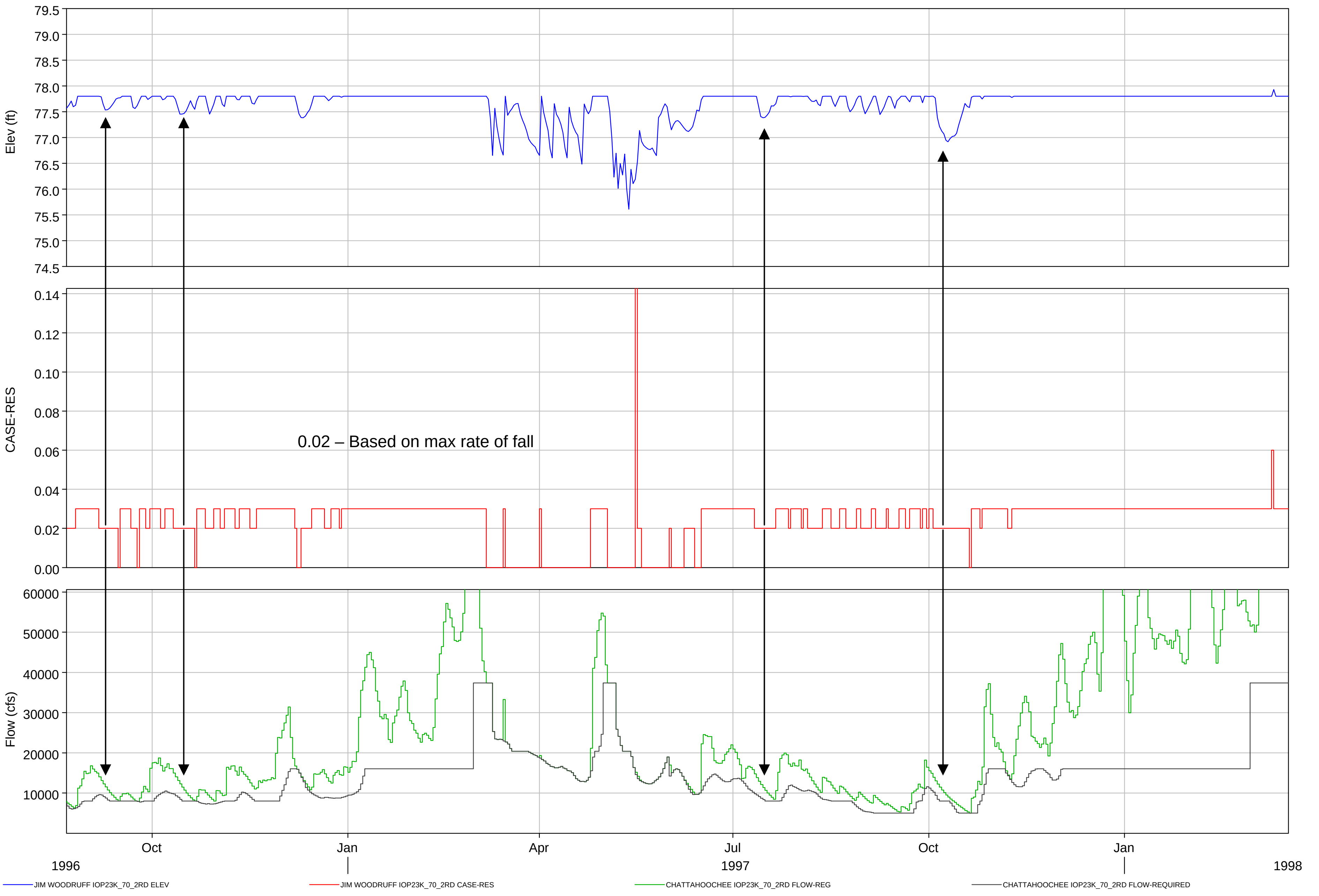
Flow	Max Rate	Max Rate in cfs
5000	0.25	365
6000	0.25	384
7000	0.25	402
8000	0.25	421
9000	0.28	495
10000	0.31	576
11000	0.34	660
12000	0.38	750
13000	0.41	824
14000	0.44	901
15000	0.47	978
16000	0.50	1064
17000	0.63	1366
18000	0.75	1682
19000	0.88	2013
20000	1.00	2329
21000	1.10	2593
22000	1.20	2863
23000	1.30	3139
24000	1.40	3420
25000	1.50	3707
26000	1.60	4000
27000	1.70	4323
28000	1.80	4654
29000	1.90	4994
30000	2.00	5343

Modeling Down Ramping Rate

- Down ramping rate is a function of previous day flow
- HEC-5 does not allow a release decision based on previous day flow
- Iterations are required to capture down ramping rate
- Basin inflow used as initial estimate of previous day release
- Each subsequent model run uses Jim Woodruff release (from previous model run) shifted forward 1 day to determine ramp rate
- 5x 10 iterations required for acceptable convergence of Jim Woodruff discharge



Elev (ft)
79.5
79.0
78.5
78.0
77.5
77.0
76.5
76.0
75.5
75.0
74.5
Oscillation in pool elevation caused from releases required to stay at TOC and ramping down to the required flow at Chattahoochee.
CASE-RES
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.00 = minimum desired flow at dam
0.02 = based on max rate of change of reservoir
0.03 = release to reach TOC
Flow (cfs)
30000
25000
20000
15000
10000
5000
Release required to Reach TOC
Example of ramping down
required
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
Dec
Jan
1952
1953
JIM WOODRUFF IOP23K_70_2RD ELEV
JIM WOODRUFF IOP23K_70_2RD CASE-RES
CHATTAHOOCHEE IOP23K_70_2RD FLOW-REG
CHATTAHOOCHEE IOP23K_70_2RD FLOW-REQUIRED



Elev (ft)
79.5
79.0
78.5
78.0
77.5
77.0
76.5
76.0
75.5
75.0
74.5
CASE-RES
0.14
0.12
0.10
0.08
0.06
0.04
0.02
0.00
0.02 – Based on max rate of fall
Flow (cfs)
60000
50000
40000
30000
20000
10000
Oct
Jan
Apr
Jul
Oct
Jan
1996
1997
1998
JIM WOODRUFF IOP23K_70_2RD ELEV
JIM WOODRUFF IOP23K_70_2RD CASE-RES
CHATTAHOOCHEE IOP23K_70_2RD FLOW-REG
CHATTAHOOCHEE IOP23K_70_2RD FLOW-REQUIRED

Modeling Notes

- Balanced operation based on Zones assignments from ACF Draft Water Control Plan
- Release decision based on highest demand
  - Minimum flow requirement
  - Water supply
  - Balance downstream reservoir
  - Hydropower
  - Reach top of rule curve
- Down ramping rate captured through iterations
- Basin Inflow provide by FWS STELLA modeling team. This ensures that the Jim Woodruff minimum release computation is based on the same data set.
- Jim Woodruff minimum release based on basin inflow is preprocessed outside of modeling in a spreadsheet. Used in the model as minimum flow requirement at Chattahoochee.
- The model does not capture the volumetric adjustment as described in “Adjustments to IOP” document. This is a periodic refinement in the operation that will be captured in real operation.

Summary

- Model captures
  - Basin Inflow – Woodruff discharge relationship
  - Fall ramping rate
  - Balanced operation, with greatest demand on downstream reservoirs West Point and WF George

Hydropower Demand

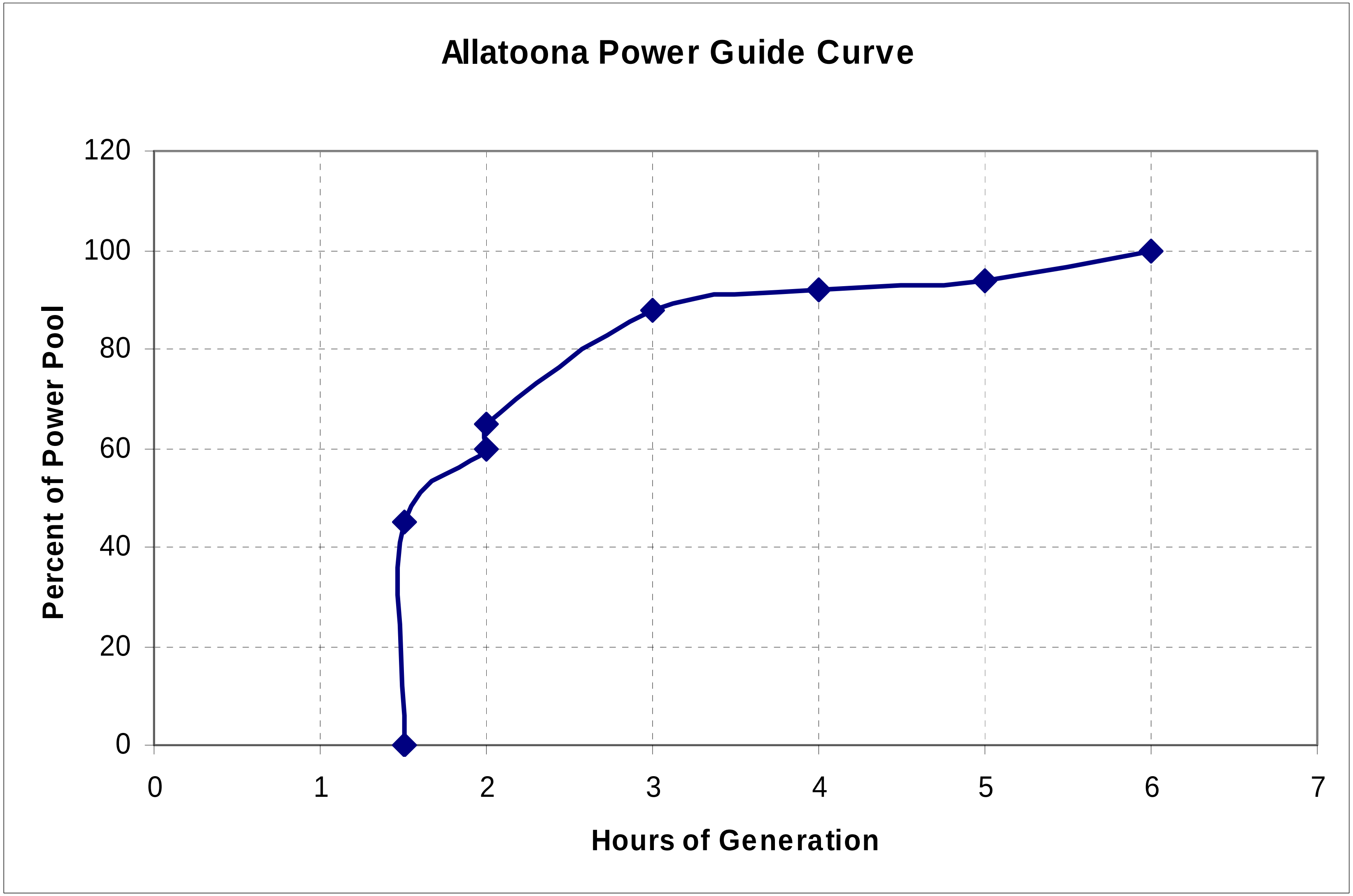
- Hydropower demand is a function of available storage. As the storage diminishes the demand reduces. Storage Zones described in the ACF Water Control manual dated 1989 used as the bases to assign the hydropower demand. Values developed from examining hydropower generation over the last few years.

IOP Model	Buford	West Point	WF George
Zone	(hours use)	(hours use)	(hours use)
1	3	4	4
2	2	2	2
3	2	2	2
4	0	0	0

HEC-5 Power Guide Curve

- PC and PF record
  - PC percent of conservation storage
  - PF plant factor (% time generating)
- Hydropower demand function of remaining conservation storage
- PR and PD record become multipliers
  - PR monthly
  - PD daily
- PC recorded use to approximate ZONES from ACF Water Control Plan

Hydropower Modeling

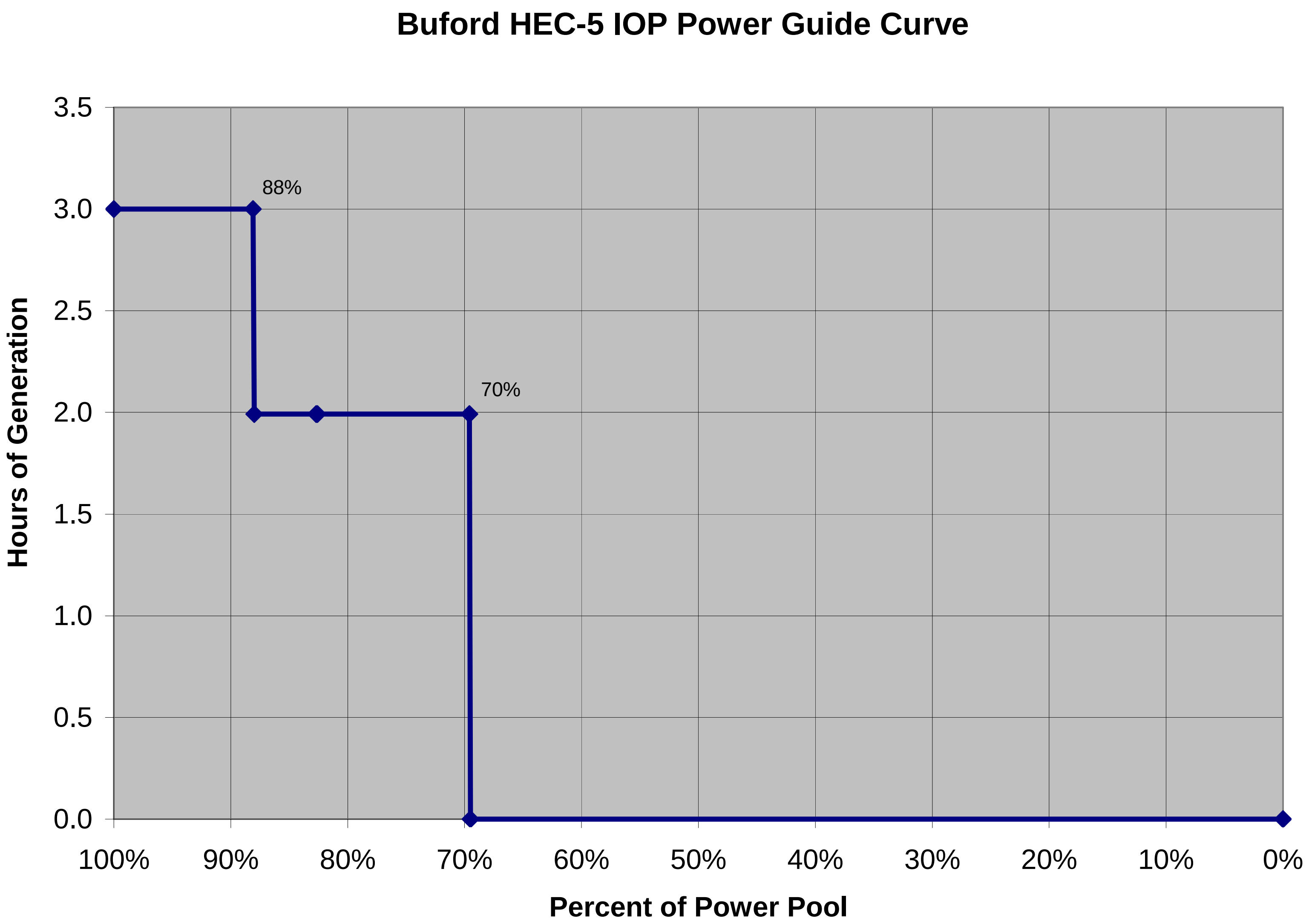


HEC-5 Power Guide Curve

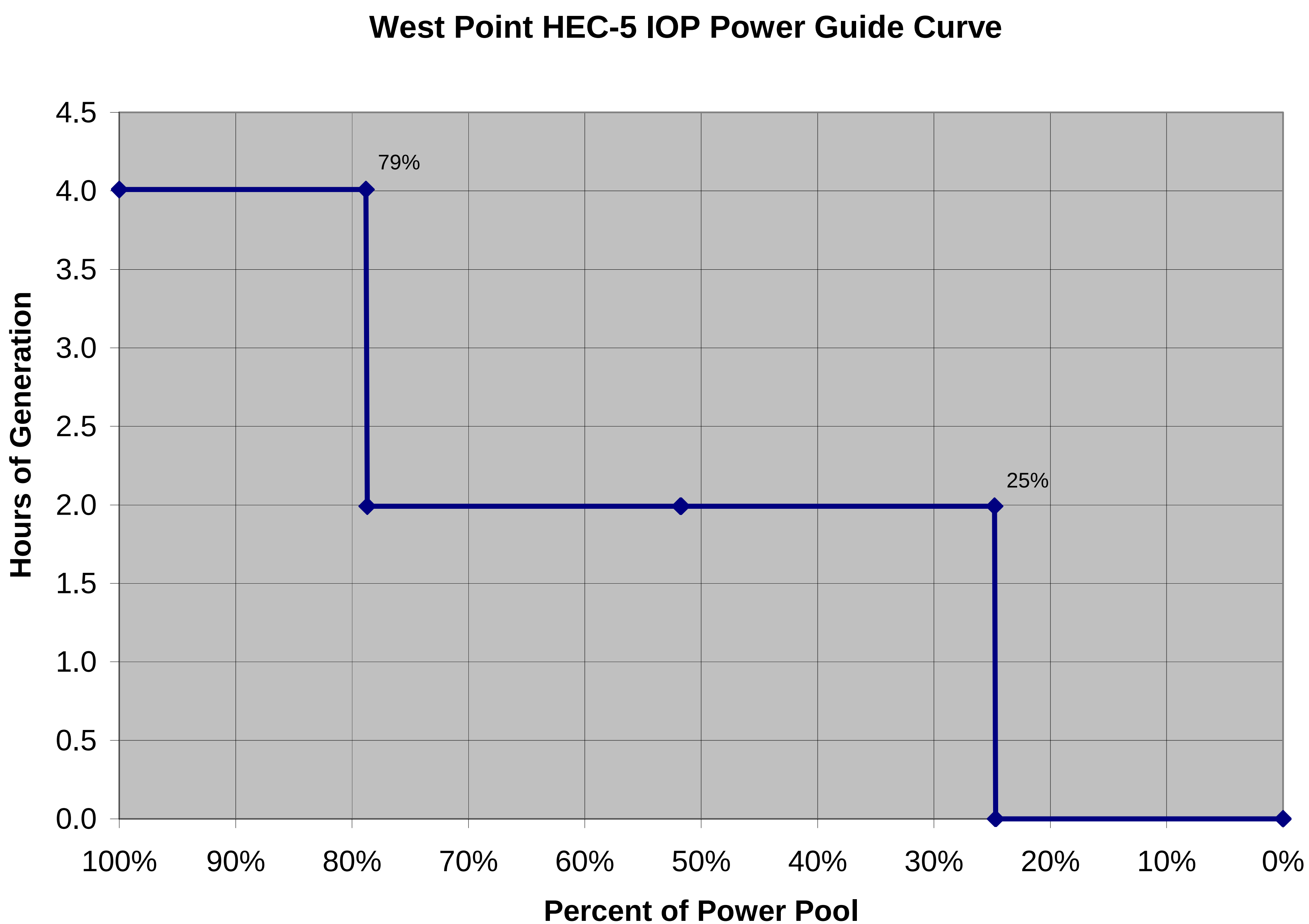
```
Buford
C "PC VALUES COMPUTED FROM AVERAGE POOL ELEVATION FOR EACH ZONE"
C PC     6       0    .826    .827    .880    .881     1.0
C "PC VALUES COMPUTED FROM TOP OF ZONES ON JUNE 1ST"
C Z1=1071 Z2=1068 Z3=1067 Z4=1065
PC     8       0    .796    .797    .862    .863    .896    .897     1.0
PF     8    .000    .000    .083    .083    .083    .083    .125    .125

West Point
C "PC VALUES COMPUTED FROM AVERAGE POOL ELEVATION FOR EACH ZONE"
C PC     7       0    .363    .364    .555    .556    .693    .694     1.0
C "PC VALUES COMPUTED FROM TOP OF ZONES ON JUNE 1ST"
C Z1=635 Z2=633 Z3=632 Z4=630
PC     8       0    .609    .610    .758    .759    .836    .837     1.0
PF     8    .000    .000    .083    .083    .083    .083    .167    .167

WF George
C "PC VALUES COMPUTED FROM AVERAGE POOL ELEVATION FOR EACH ZONE"
C PC     8       0    .247    .248    .517    .518    .787    .788     1.0
C "PC VALUES COMPUTED FROM TOP OF ZONES ON JUNE 1ST"
C Z1=190 Z2=189 Z3=188 Z4=186
PC     8       0    .309    .310    .643    .644    .818    .819     1.0
PF     8    .000    .000    .083    .083    .083    .083    .167    .167
```

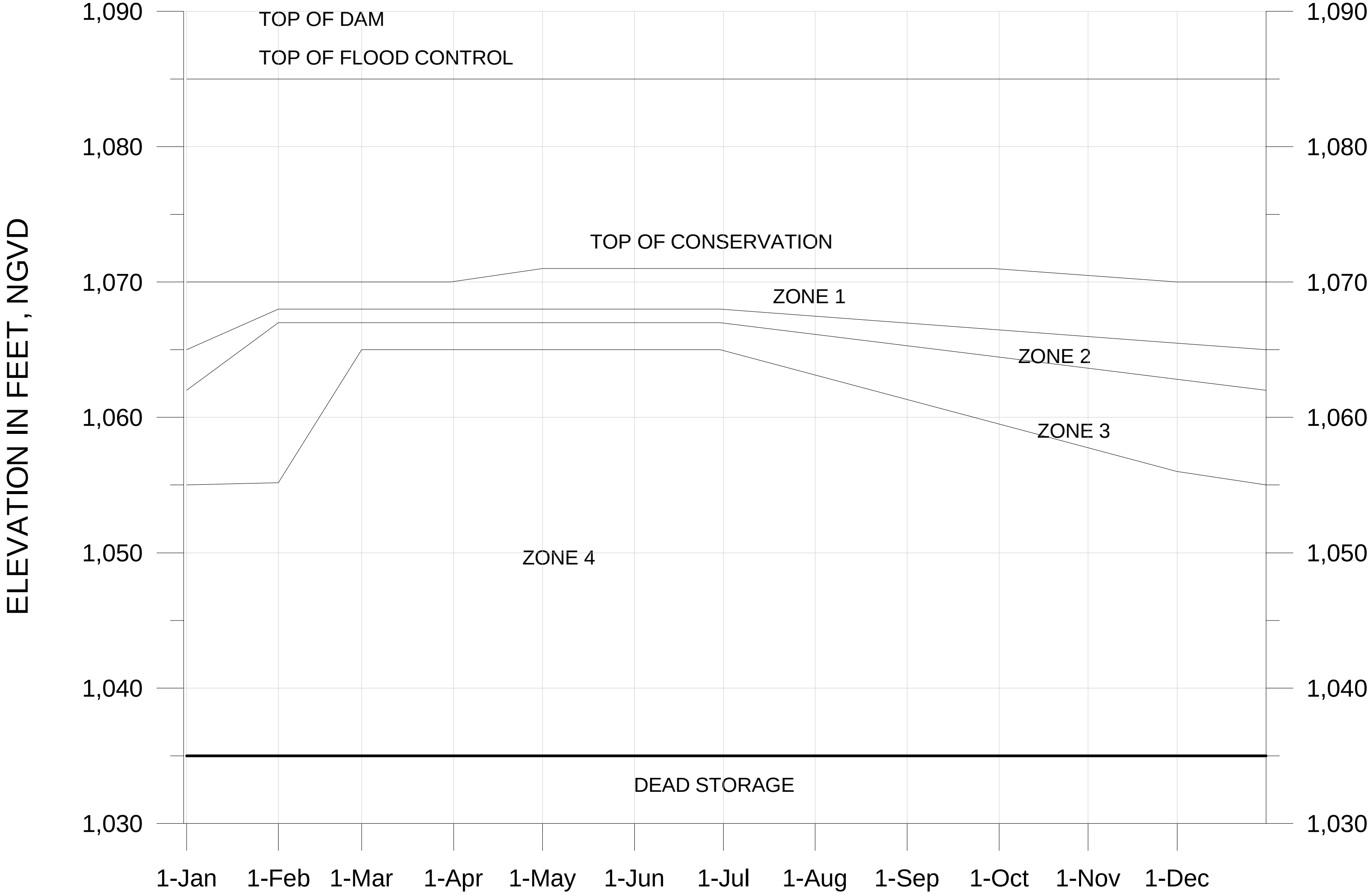


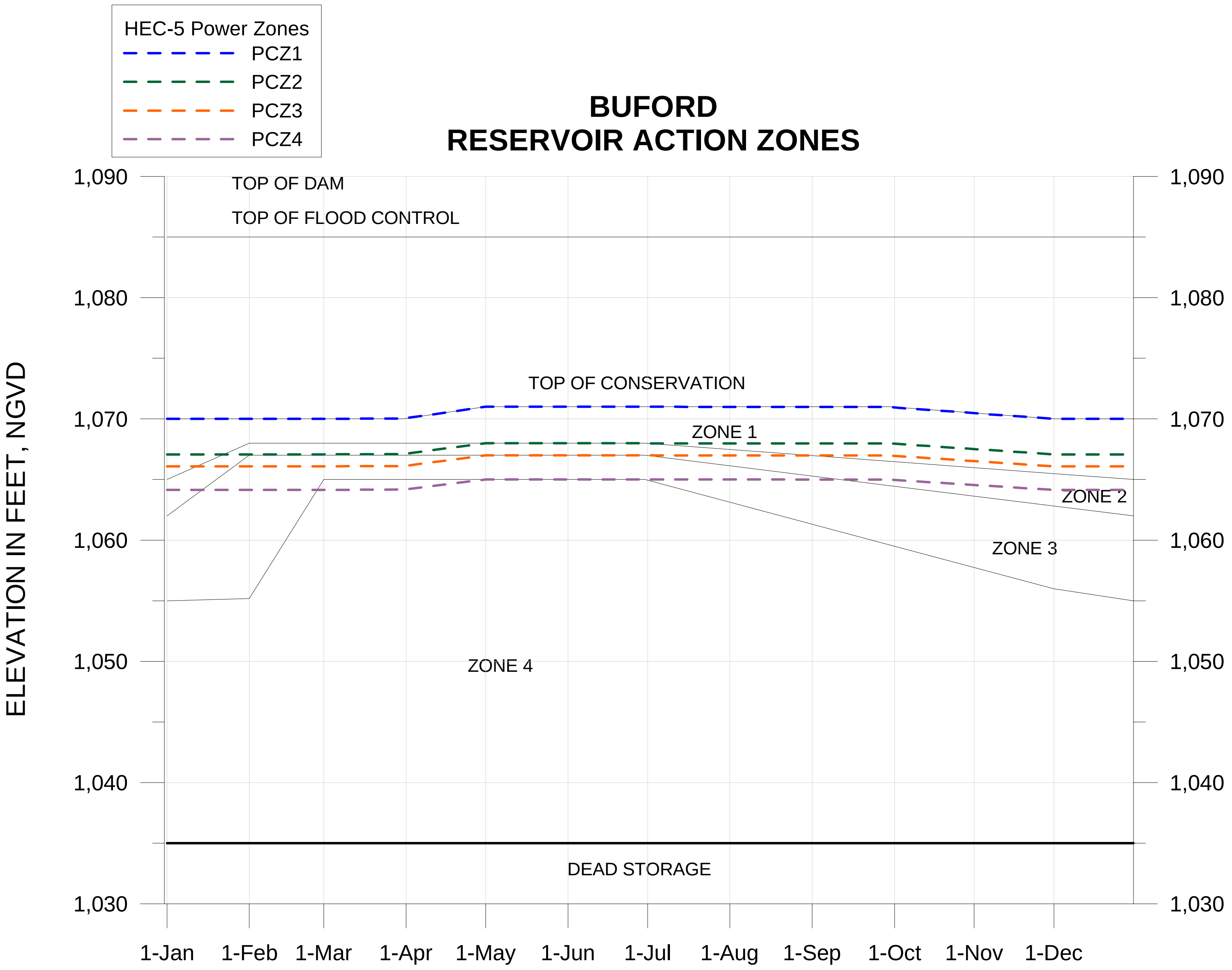
Buford HEC-5 IOP Power Guide Curve
Hours of Generation
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
88%
70%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Power Pool



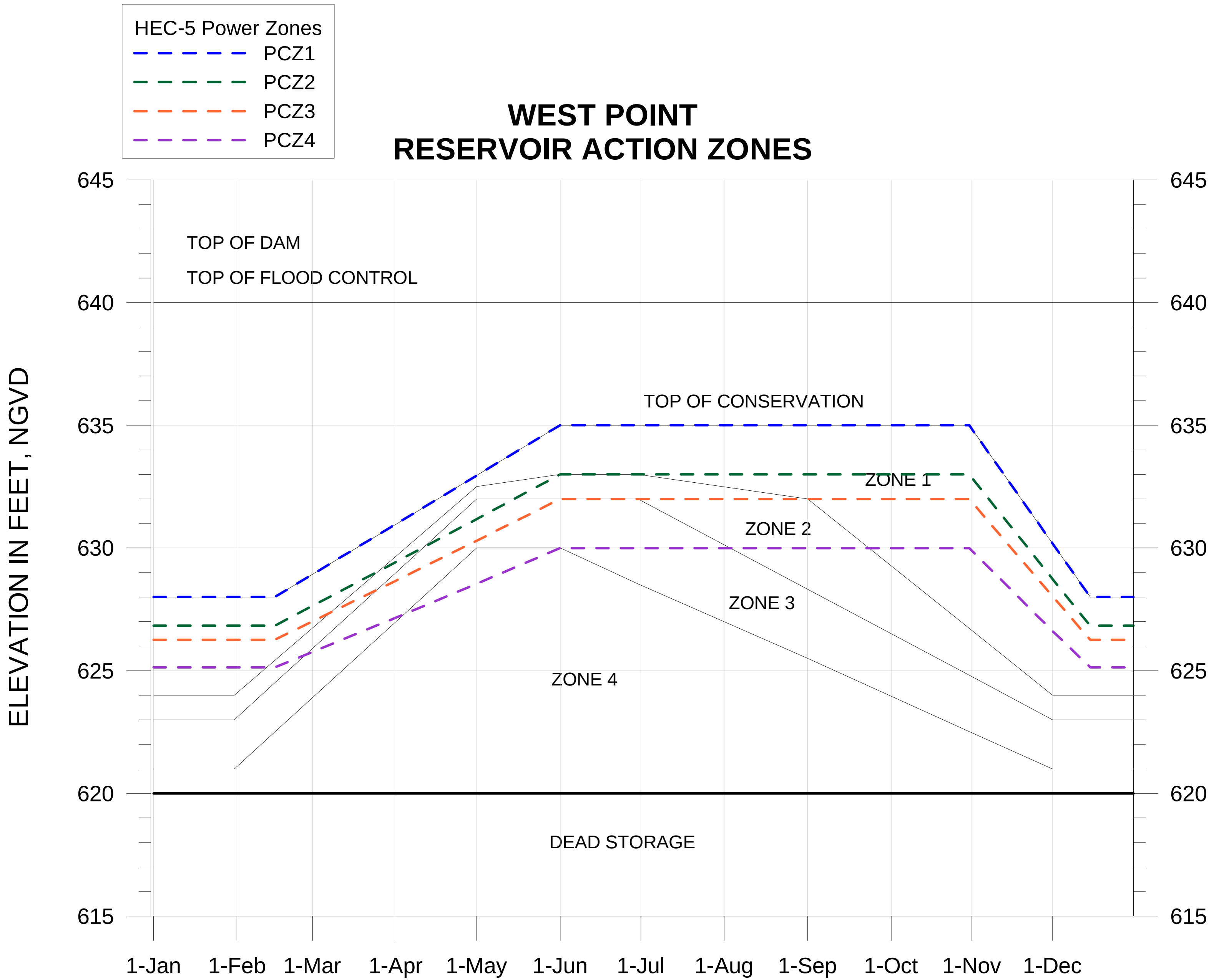
West Point HEC-5 IOP Power Guide Curve
Hours of Generation
4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0
79%
25%
100%
90%
80%
70%
60%
50%
40%
30%
20%
10%
0%
Percent of Power Pool

BUFORD
RESERVOIR ACTION ZONES

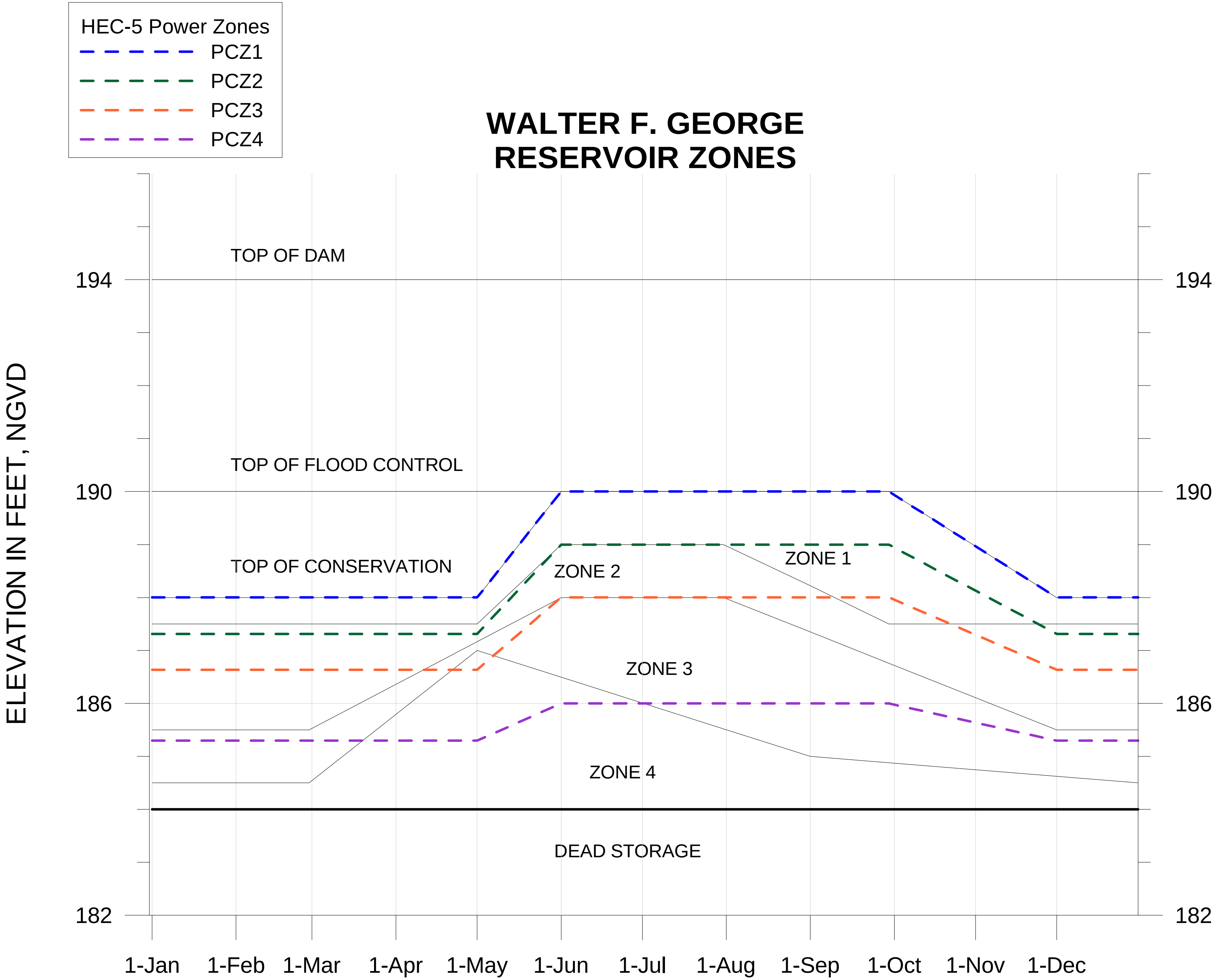




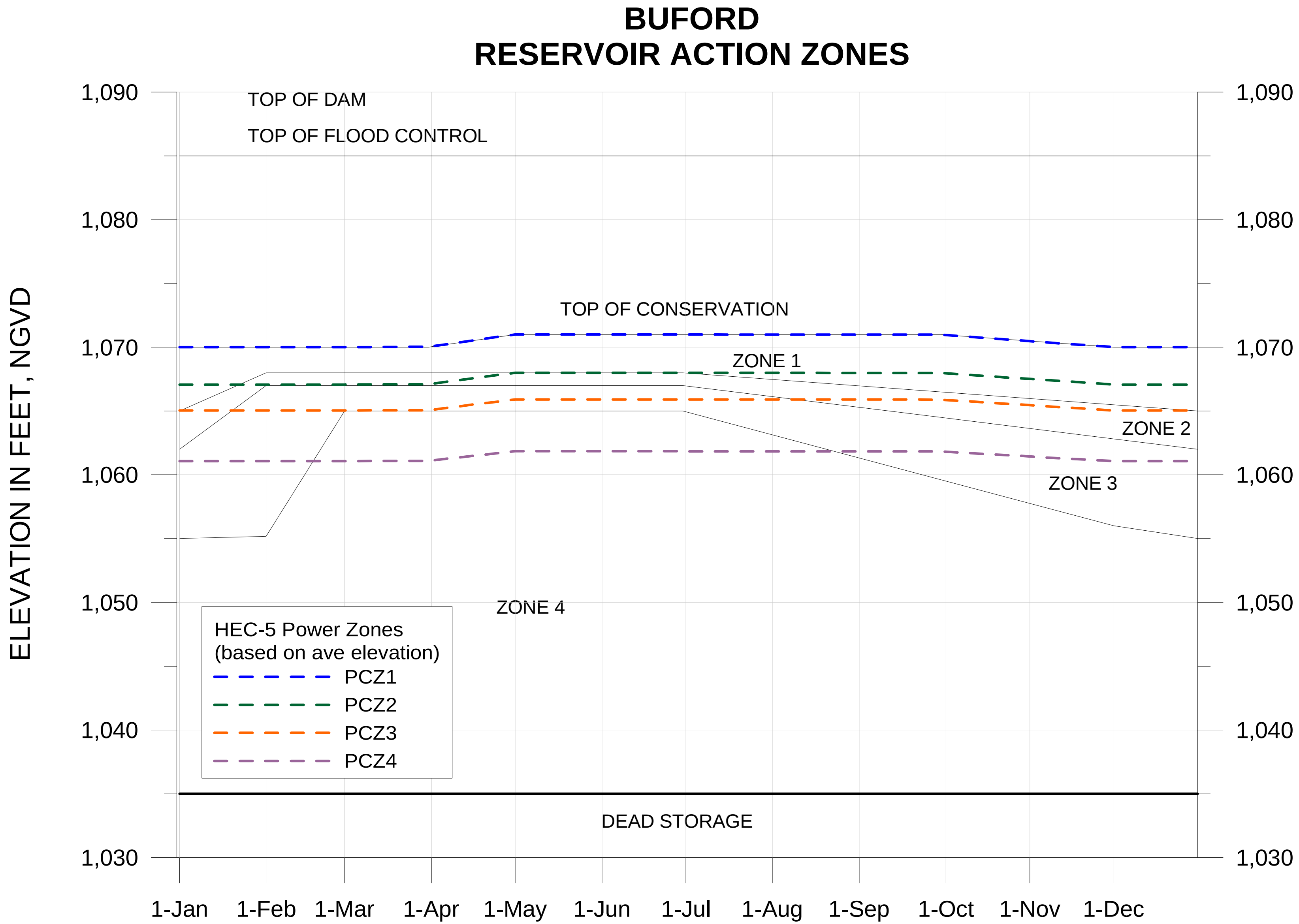
HEC-5 Power Zones
PCZ1
PCZ2
PCZ3
PCZ4
BUFORD
RESERVOIR ACTION ZONES
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
ZONE 1
ZONE 2
ZONE 3
ZONE 4
DEAD STORAGE
ELEVATION IN FEET, NGVD
1,090
1,080
1,070
1,060
1,050
1,040
1,030
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec



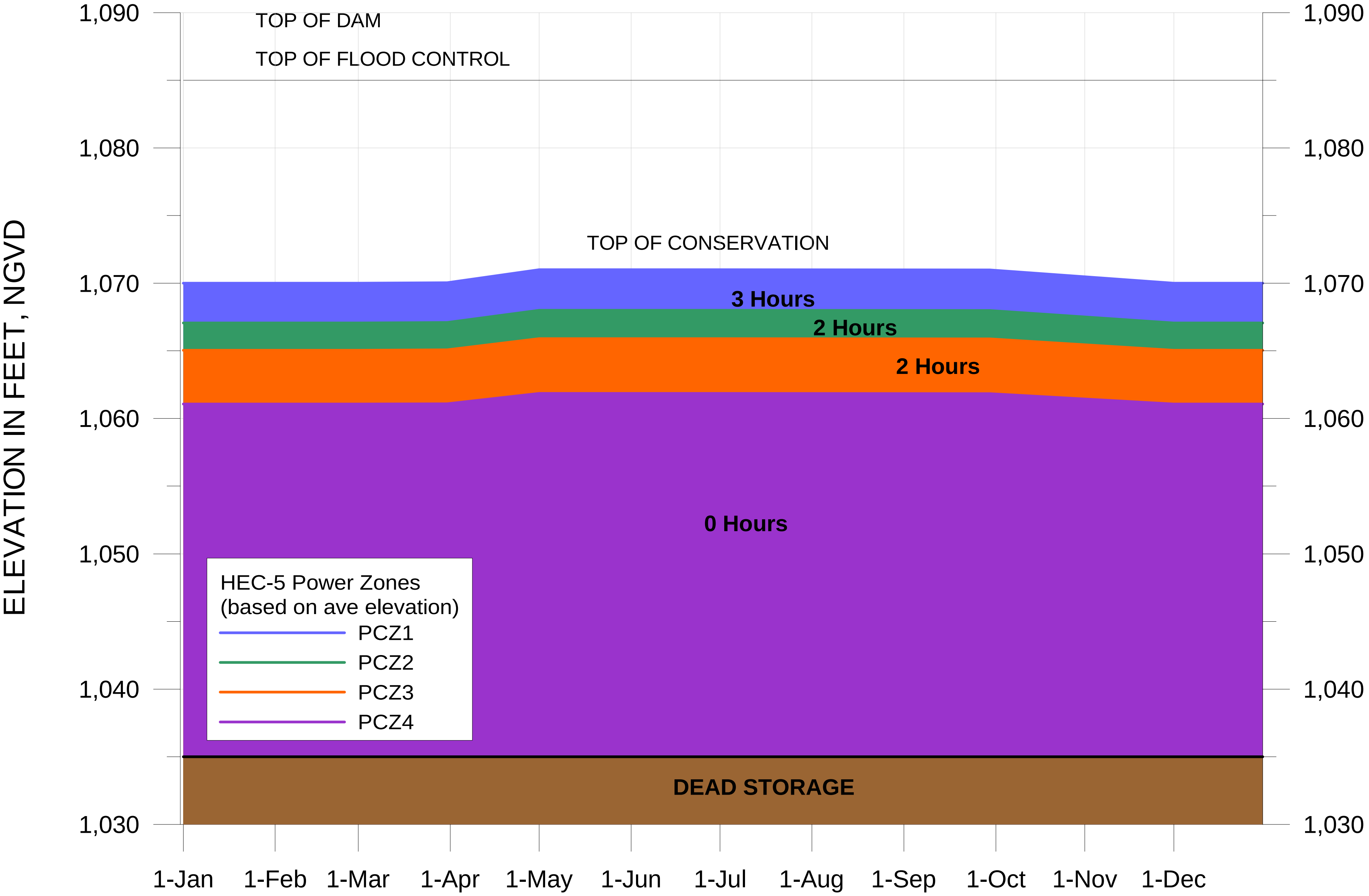
HEC-5 Power Zones
PCZ1
PCZ2
PCZ3
PCZ4
WEST POINT
RESERVOIR ACTION ZONES
ELEVATION IN FEET, NGVD
645
640
635
630
625
620
615
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
ZONE 1
ZONE 2
ZONE 3
ZONE 4
DEAD STORAGE
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

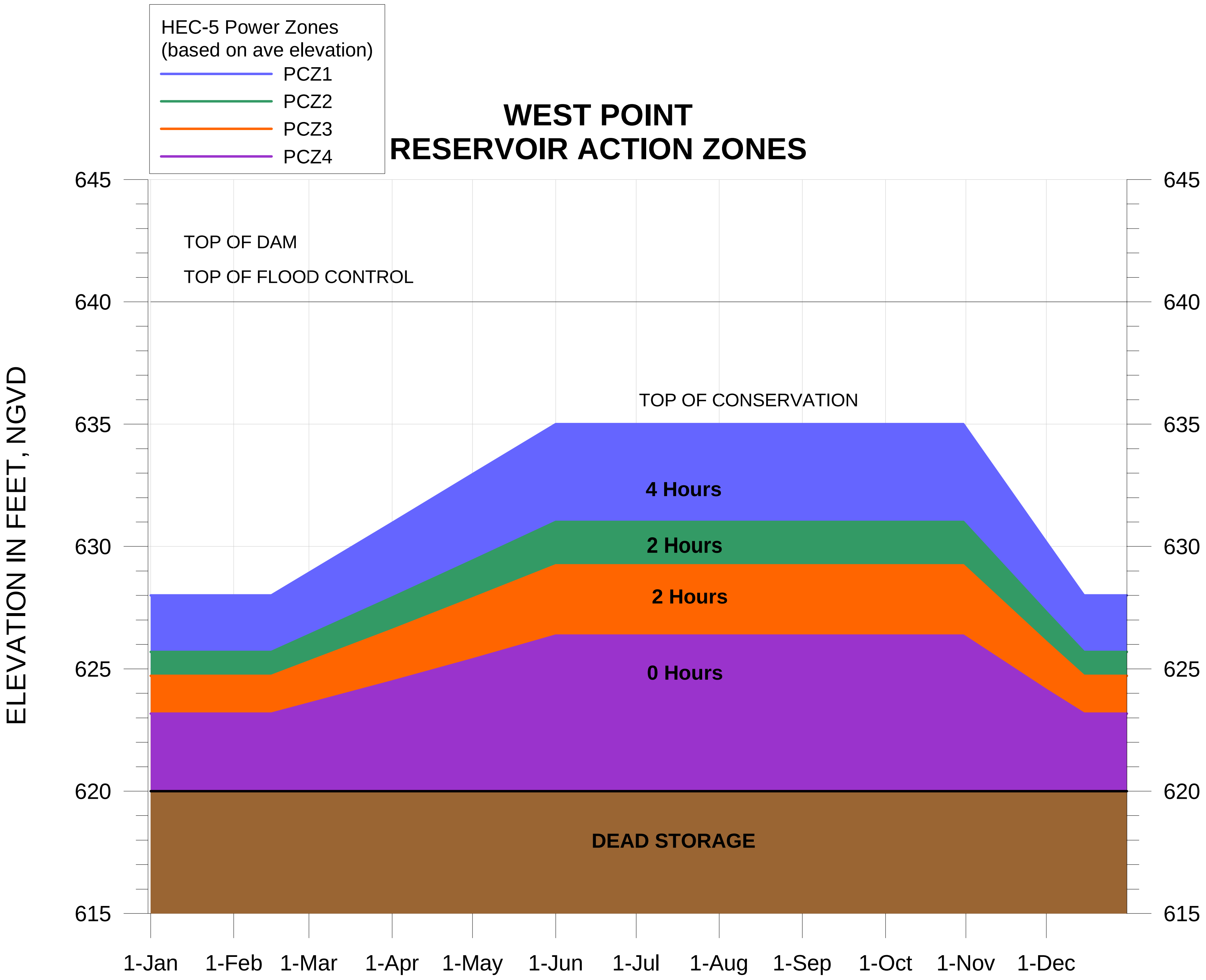


HEC-5 Power Zones
PCZ1
PCZ2
PCZ3
PCZ4
WALTER F. GEORGE
RESERVOIR ZONES
ELEVATION IN FEET, NGVD
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
ZONE 1
ZONE 2
ZONE 3
ZONE 4
DEAD STORAGE
194
190
186
182
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

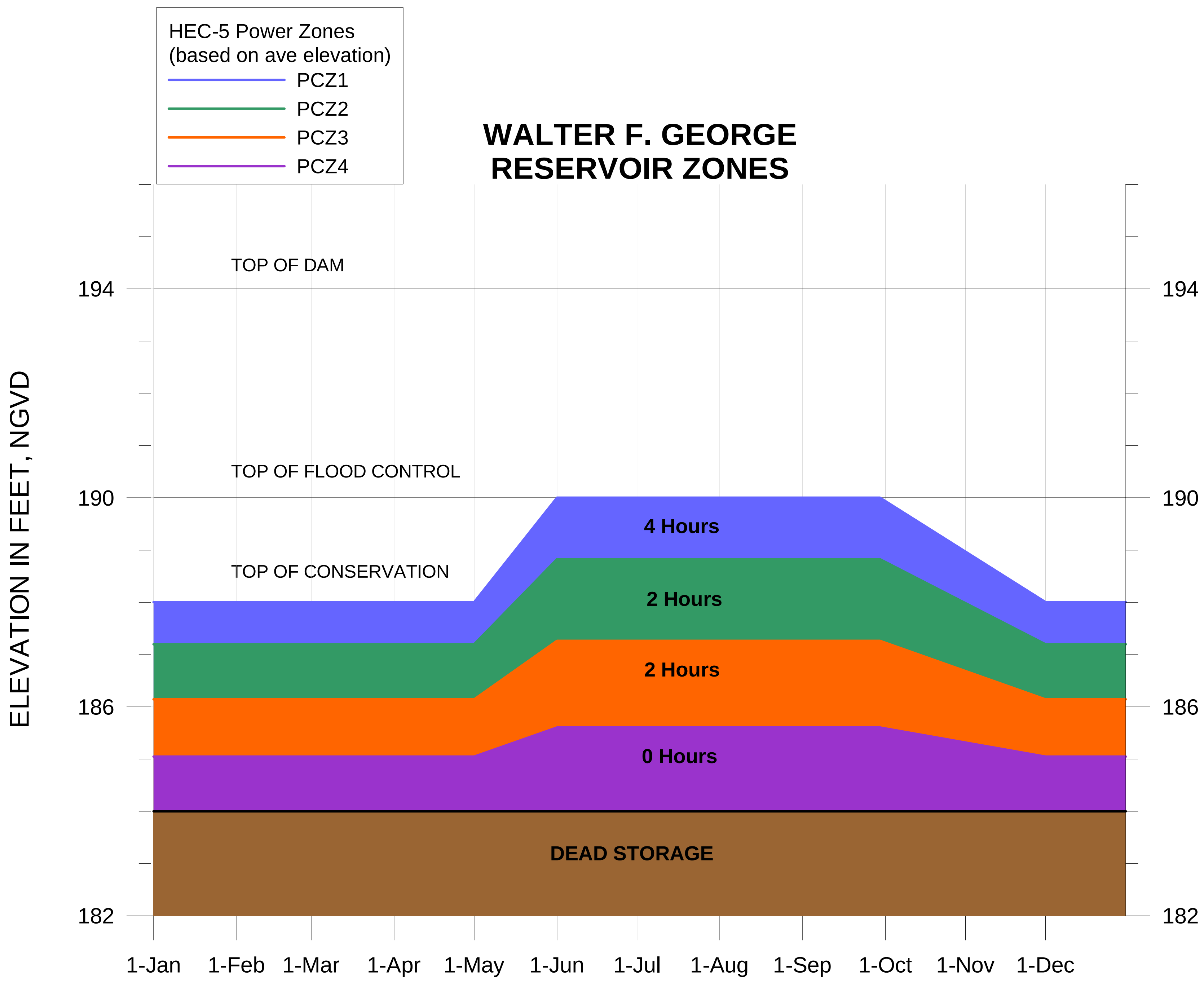

BUFORD
RESERVOIR ACTION ZONES
ELEVATION IN FEET, NGVD
1,090
1,080
1,070
1,060
1,050
1,040
1,030
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
ZONE 1
ZONE 2
ZONE 3
ZONE 4
DEAD STORAGE
HEC-5 Power Zones
(based on ave elevation)
PCZ1
PCZ2
PCZ3
PCZ4
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

BUFORD
RESERVOIR ACTION ZONES

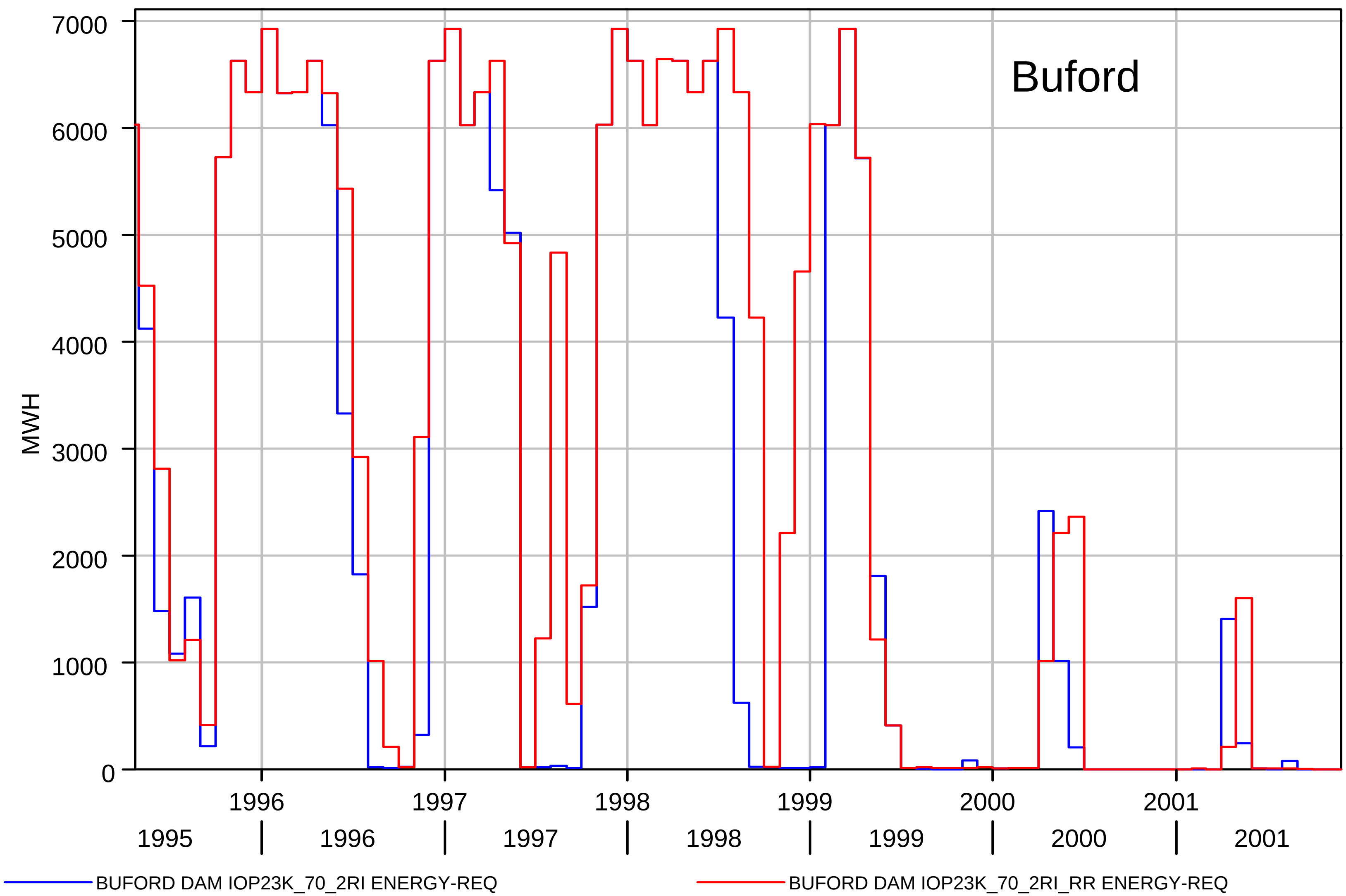




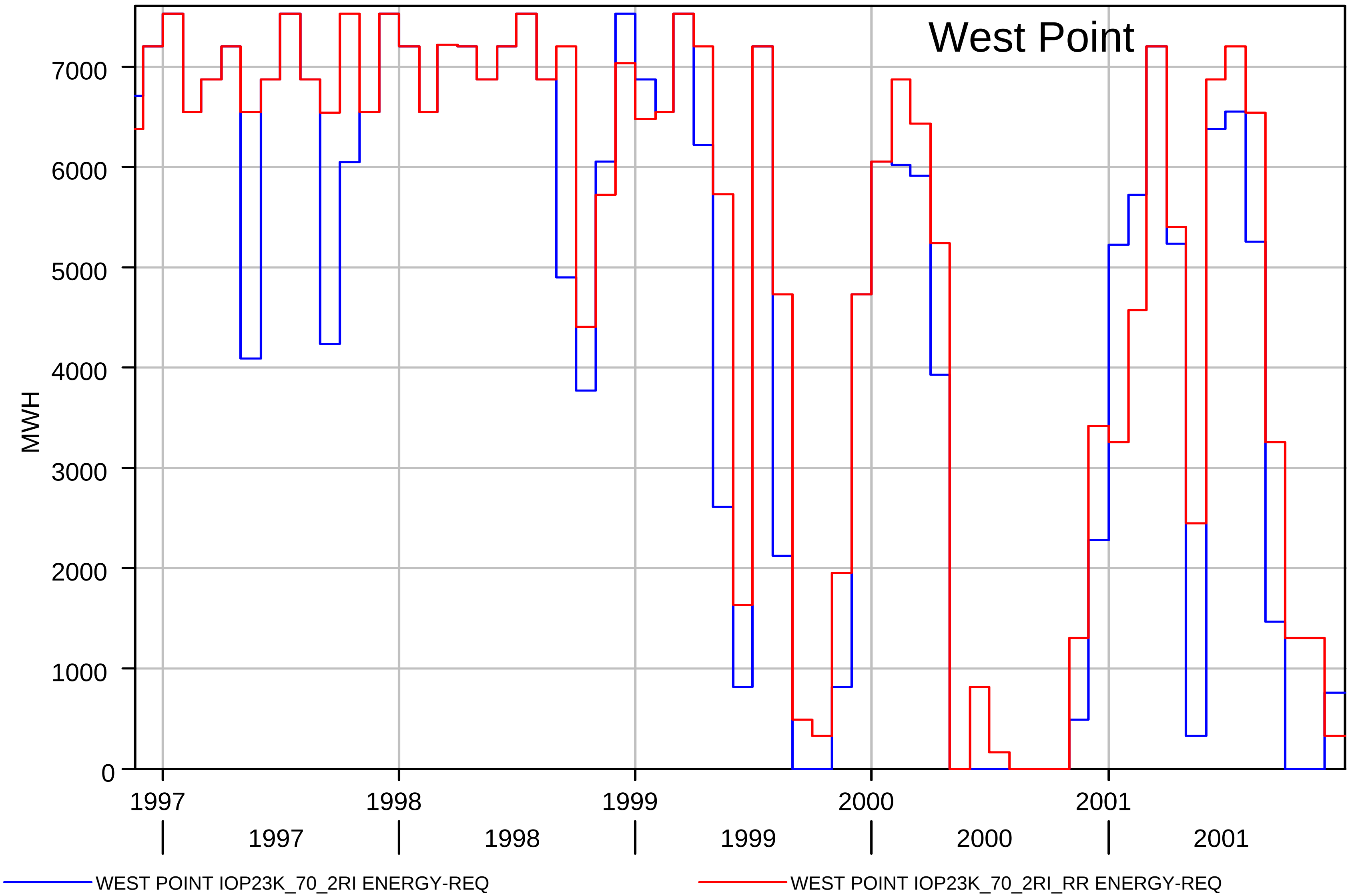
HEC-5 Power Zones
(based on ave elevation)
PCZ1
PCZ2
PCZ3
PCZ4
WEST POINT
RESERVOIR ACTION ZONES
ELEVATION IN FEET, NGVD
645
640
635
630
625
620
615
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
4 Hours
2 Hours
2 Hours
0 Hours
DEAD STORAGE
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec


WALTER F. GEORGE
RESERVOIR ZONES
HEC-5 Power Zones
(based on ave elevation)
PCZ1
PCZ2
PCZ3
PCZ4
TOP OF DAM
TOP OF FLOOD CONTROL
TOP OF CONSERVATION
4 Hours
2 Hours
2 Hours
0 Hours
DEAD STORAGE
ELEVATION IN FEET, NGVD
194
190
186
182
1-Jan
1-Feb
1-Mar
1-Apr
1-May
1-Jun
1-Jul
1-Aug
1-Sep
1-Oct
1-Nov
1-Dec

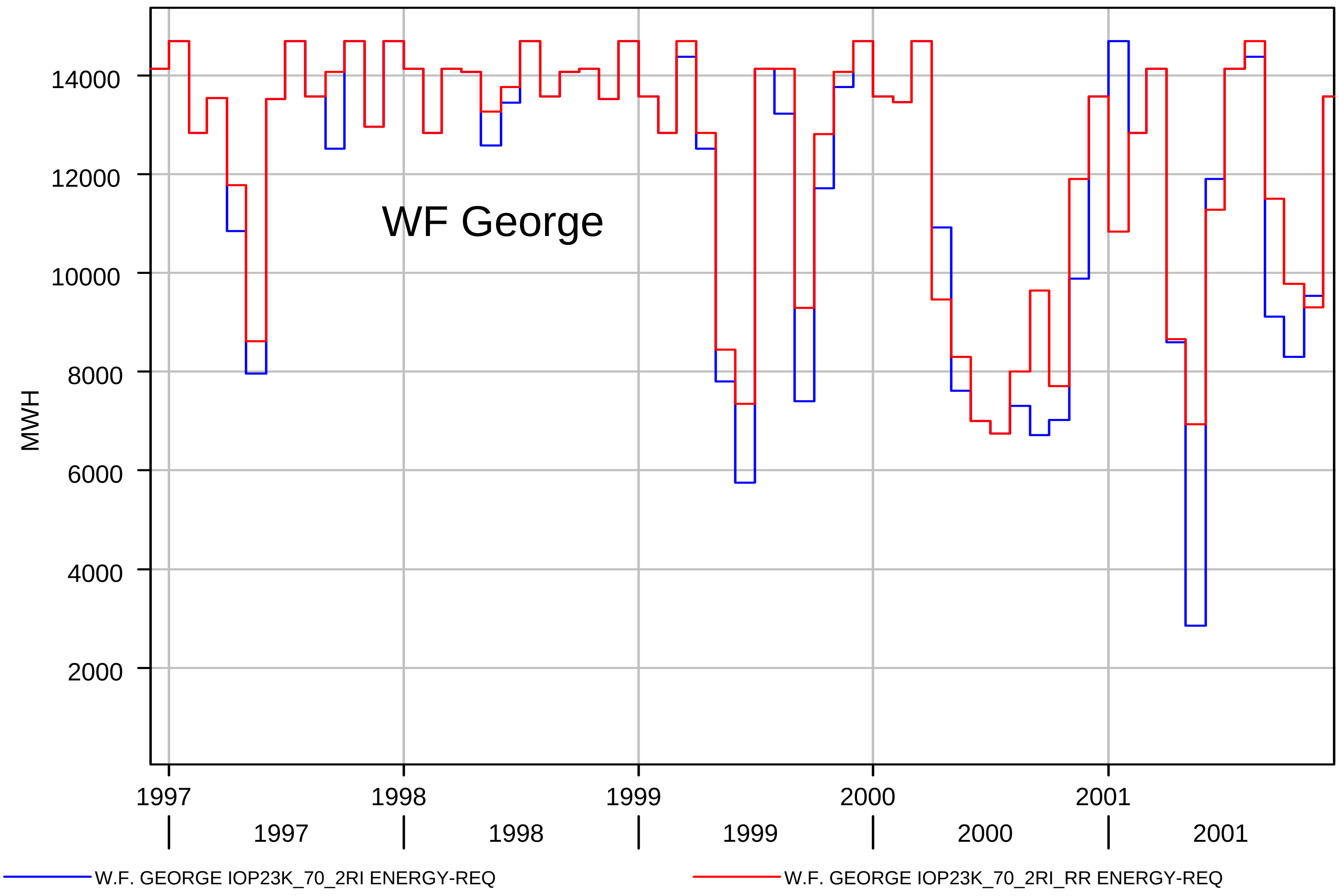
Difference in Energy Demand



Difference in Energy Demand

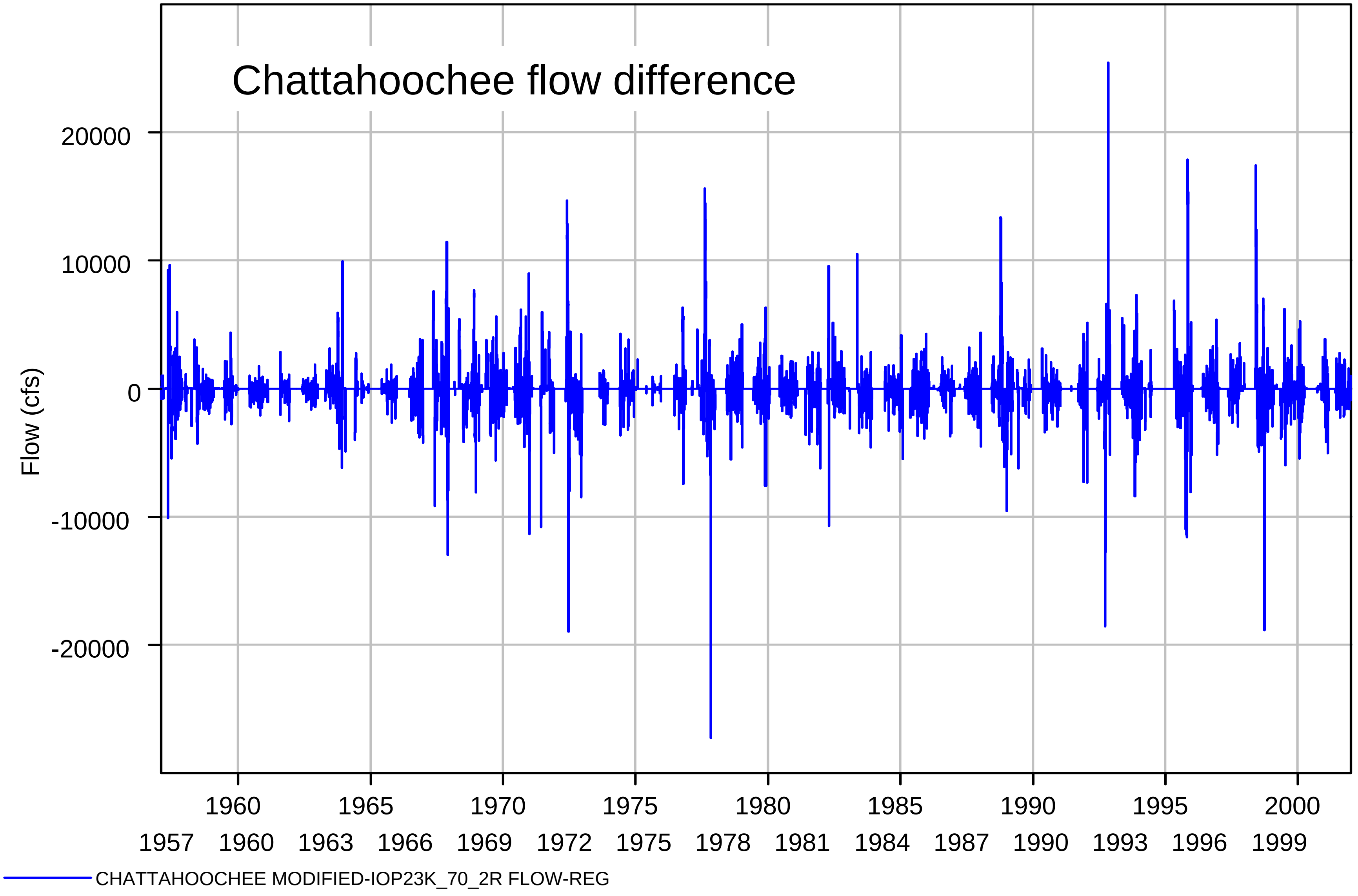


Difference in Energy Demand

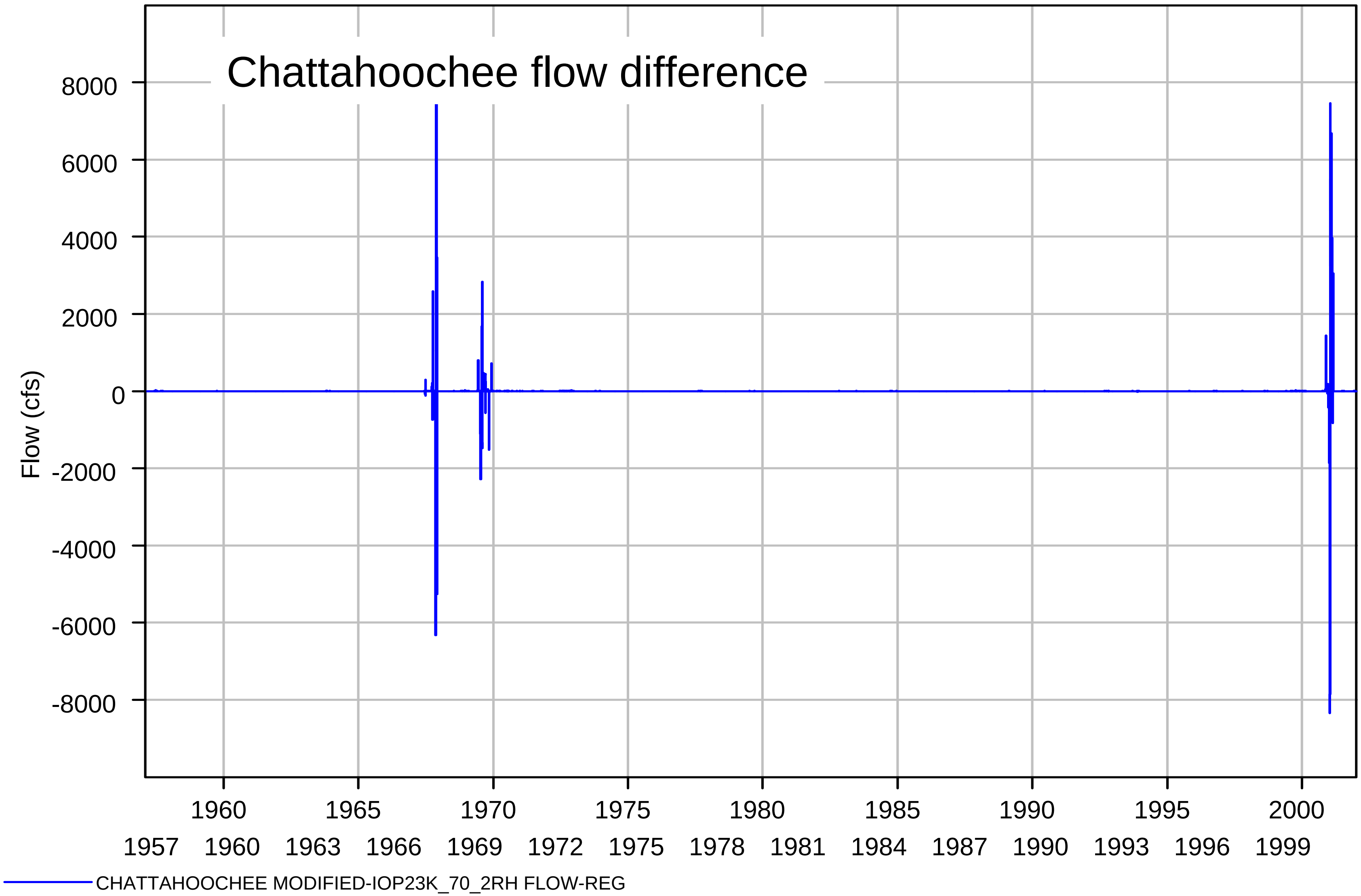


IOP HEC-5 Modeling Results

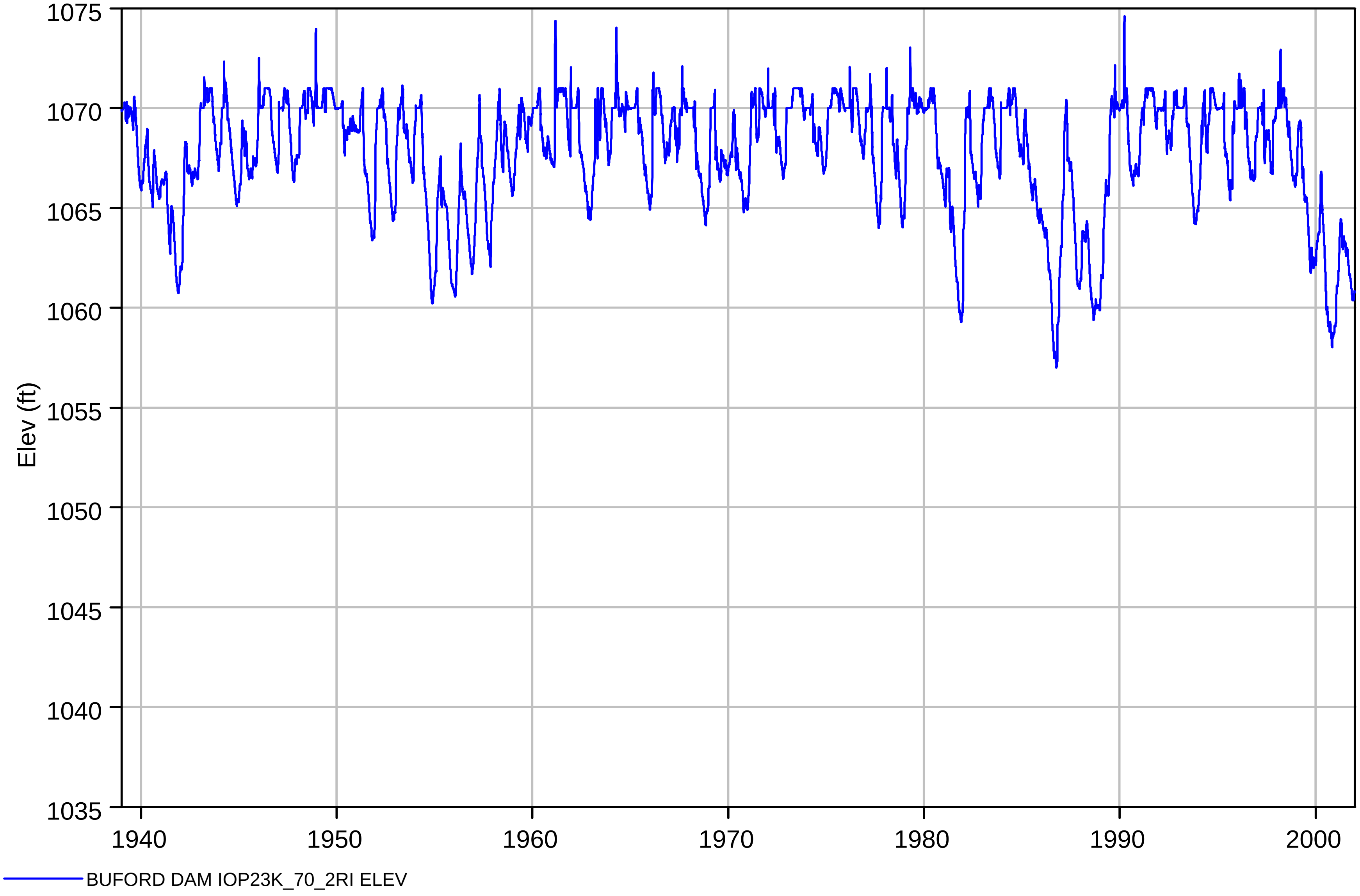
IOP Model Output – 2nd Iteration



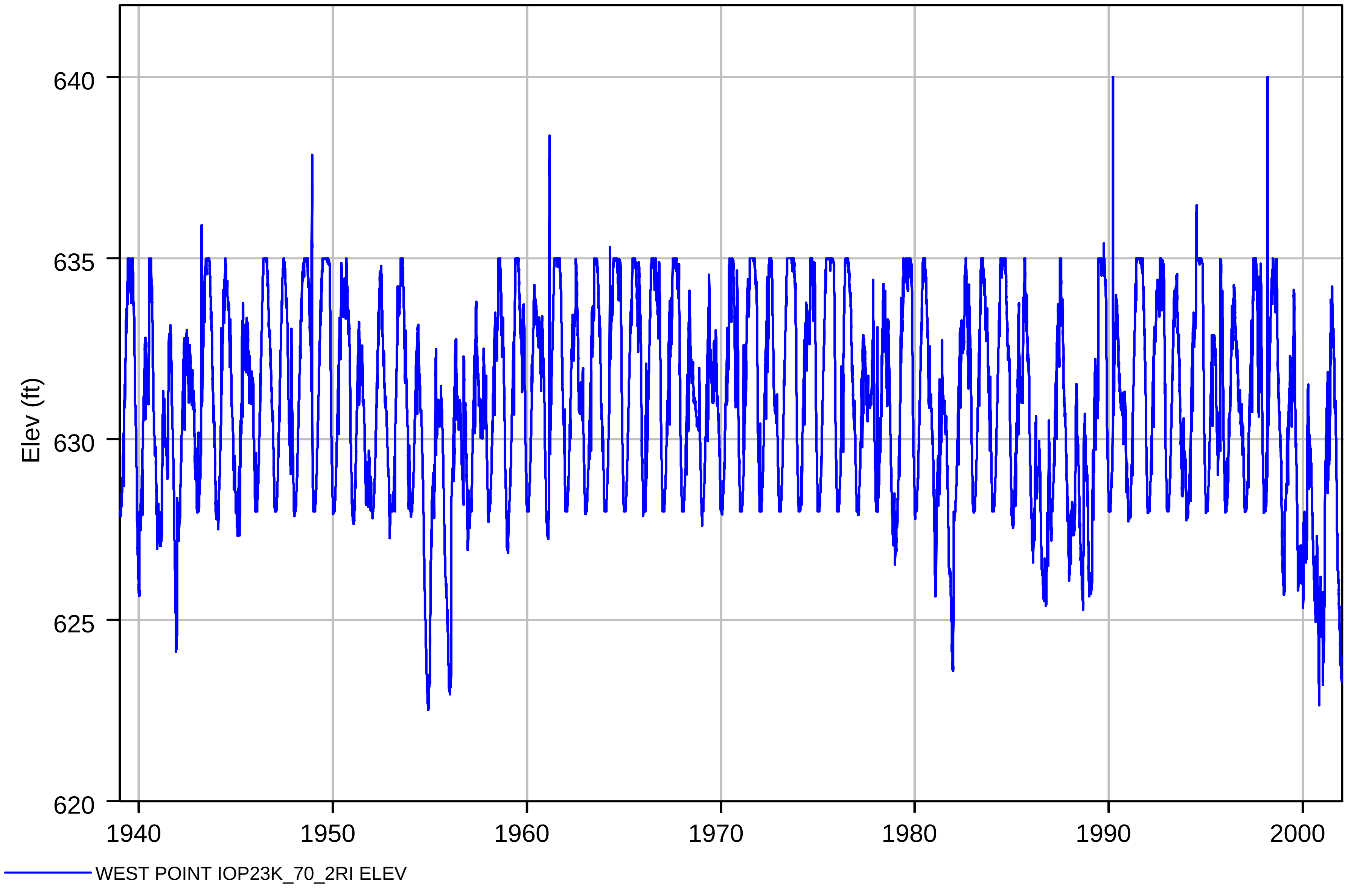
IOP Model Output - 10th Iteration



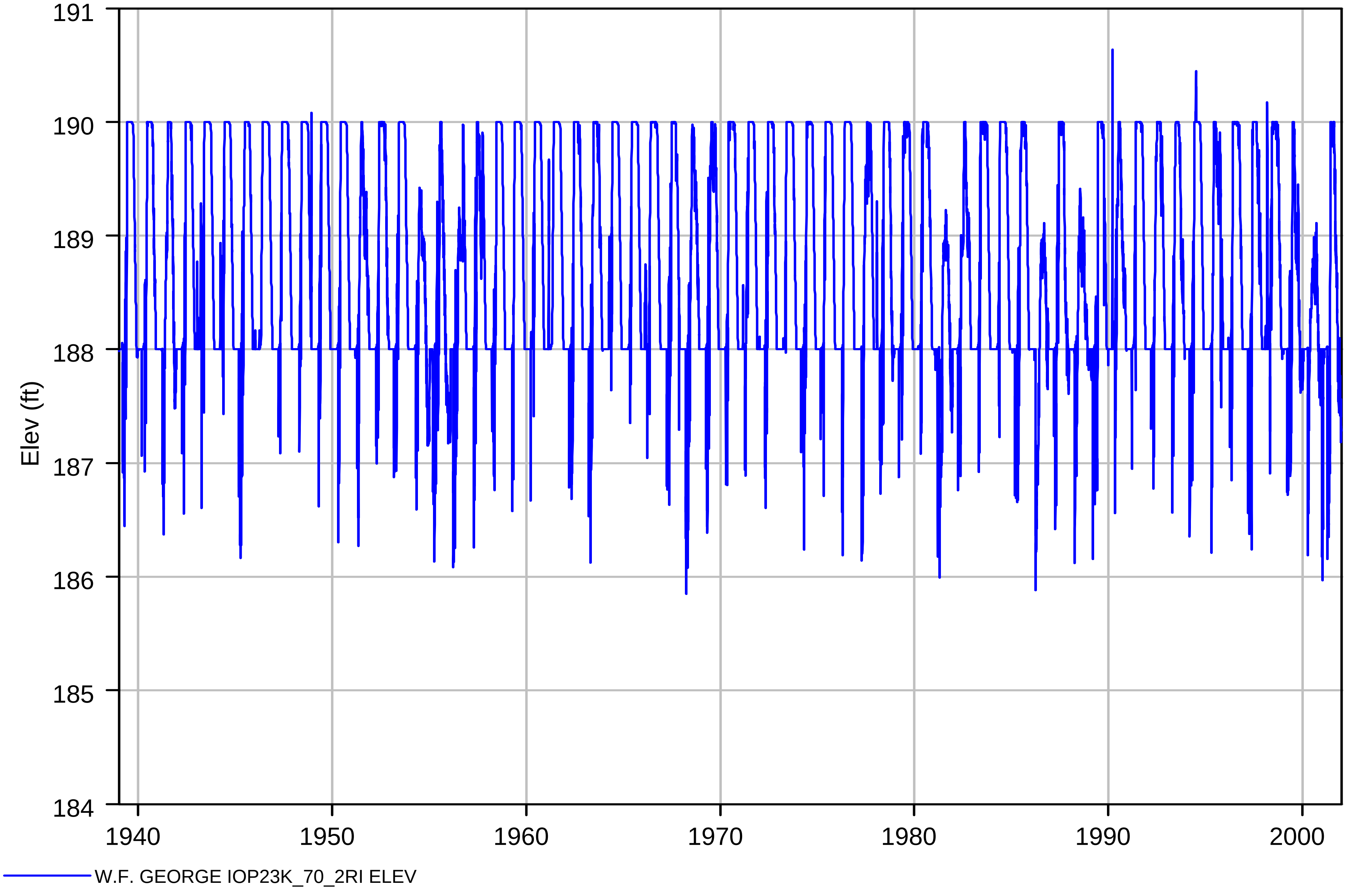
IOP Modeling Results – Buford Elevation



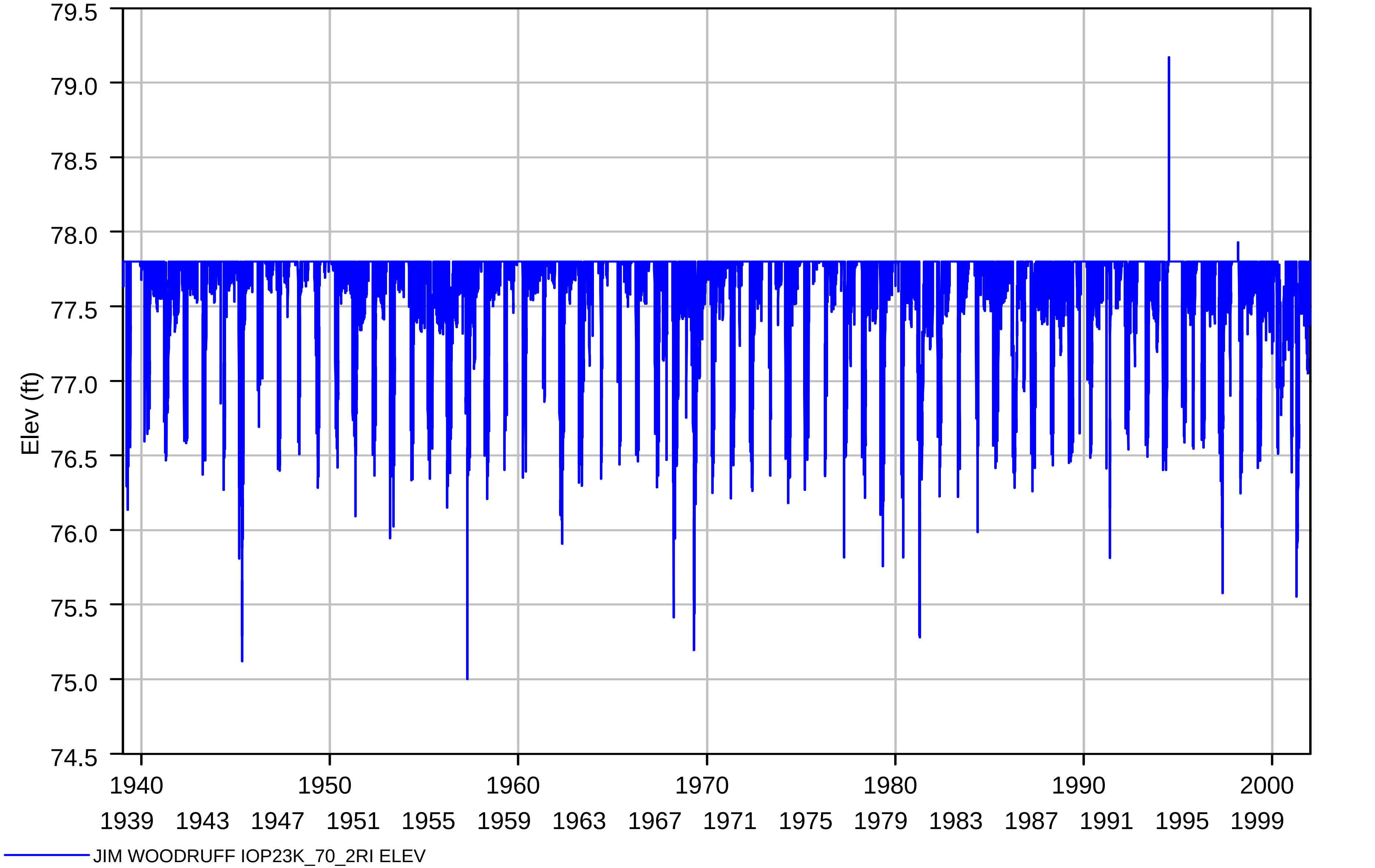
IOP Modeling Results – West Point Elevation



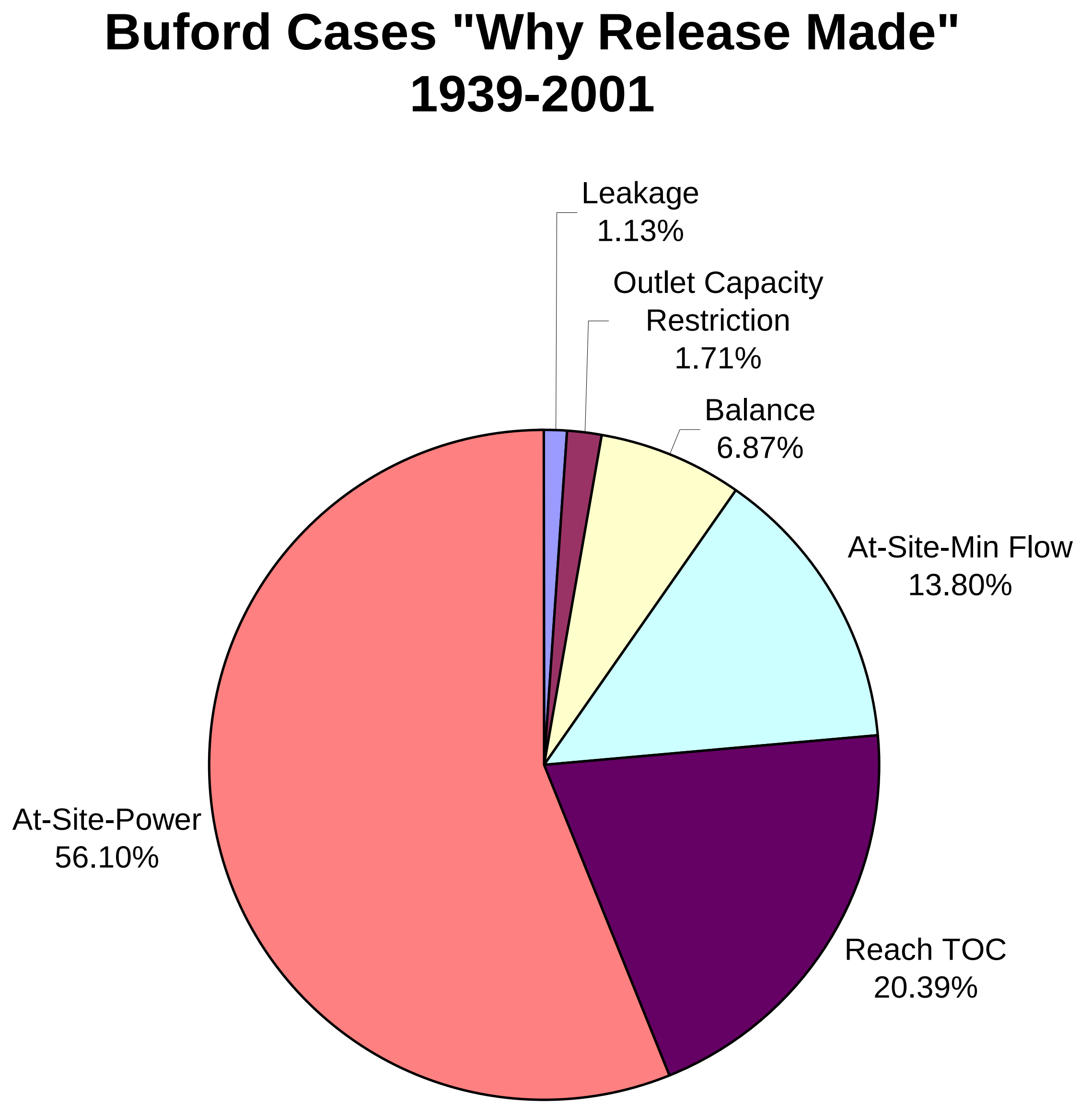
IOP Modeling Results – WF George Elevation



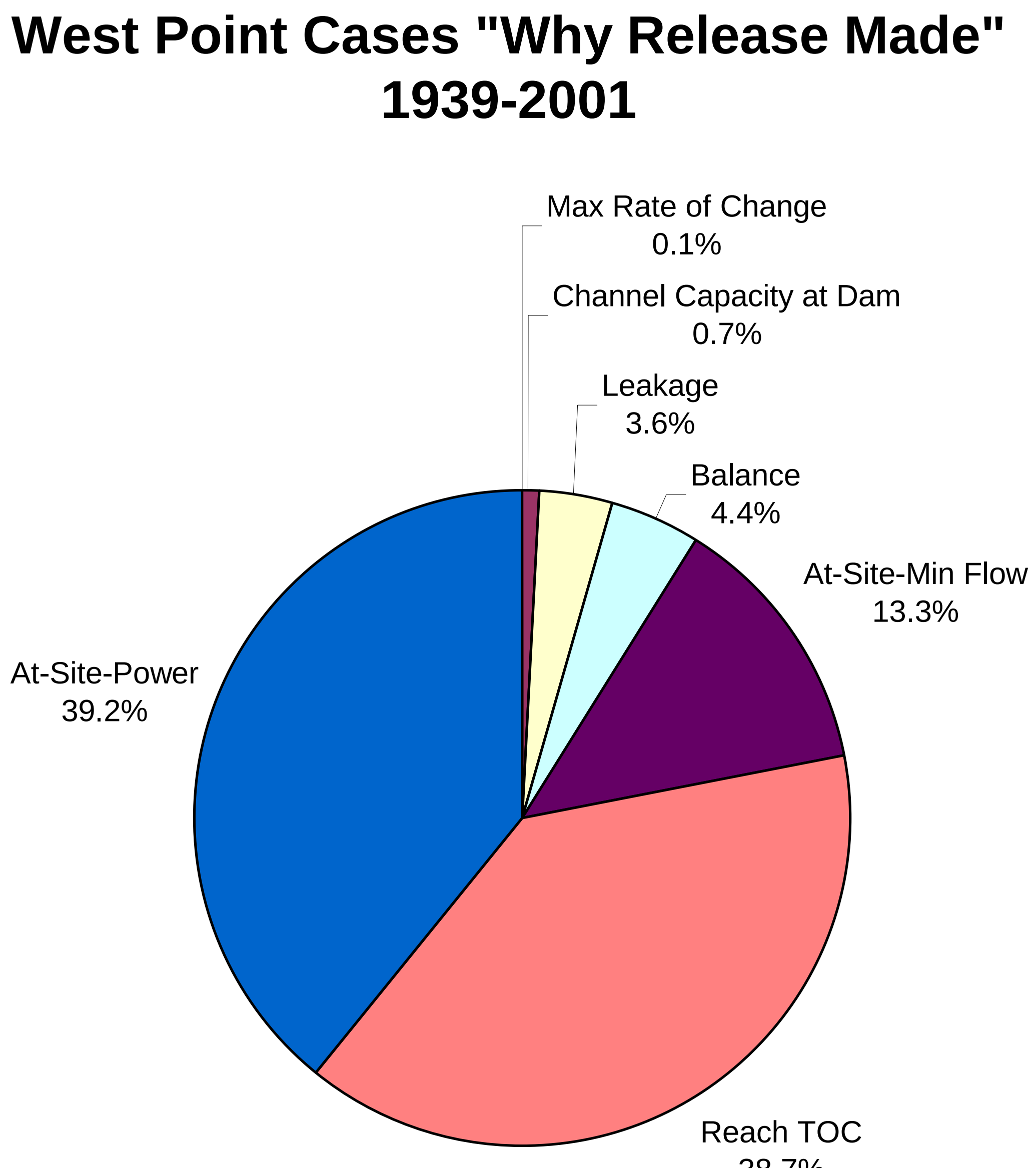
IOP Modeling Results – Jim Woodruff Elevation



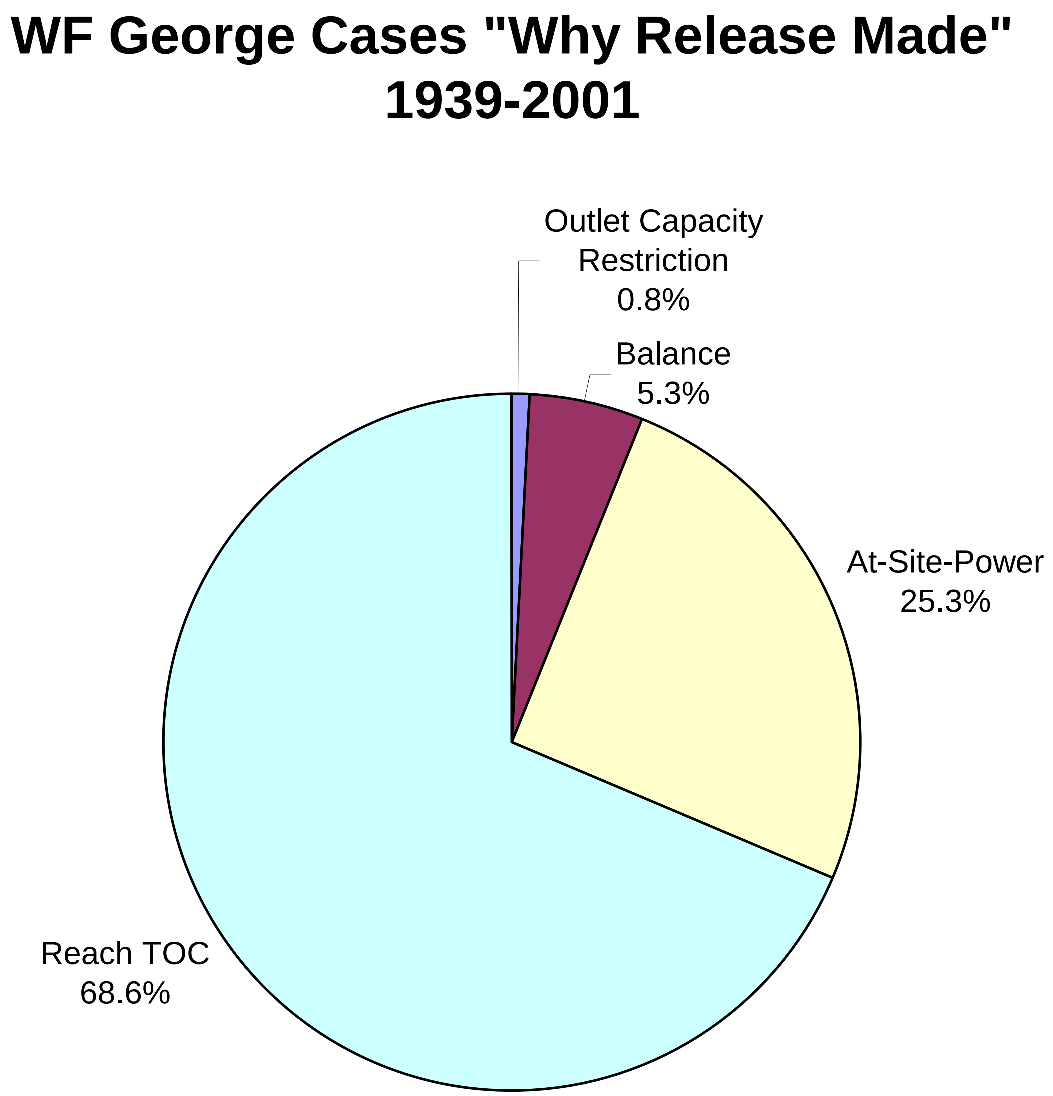
IOP Modeling Results



IOP Modeling Results

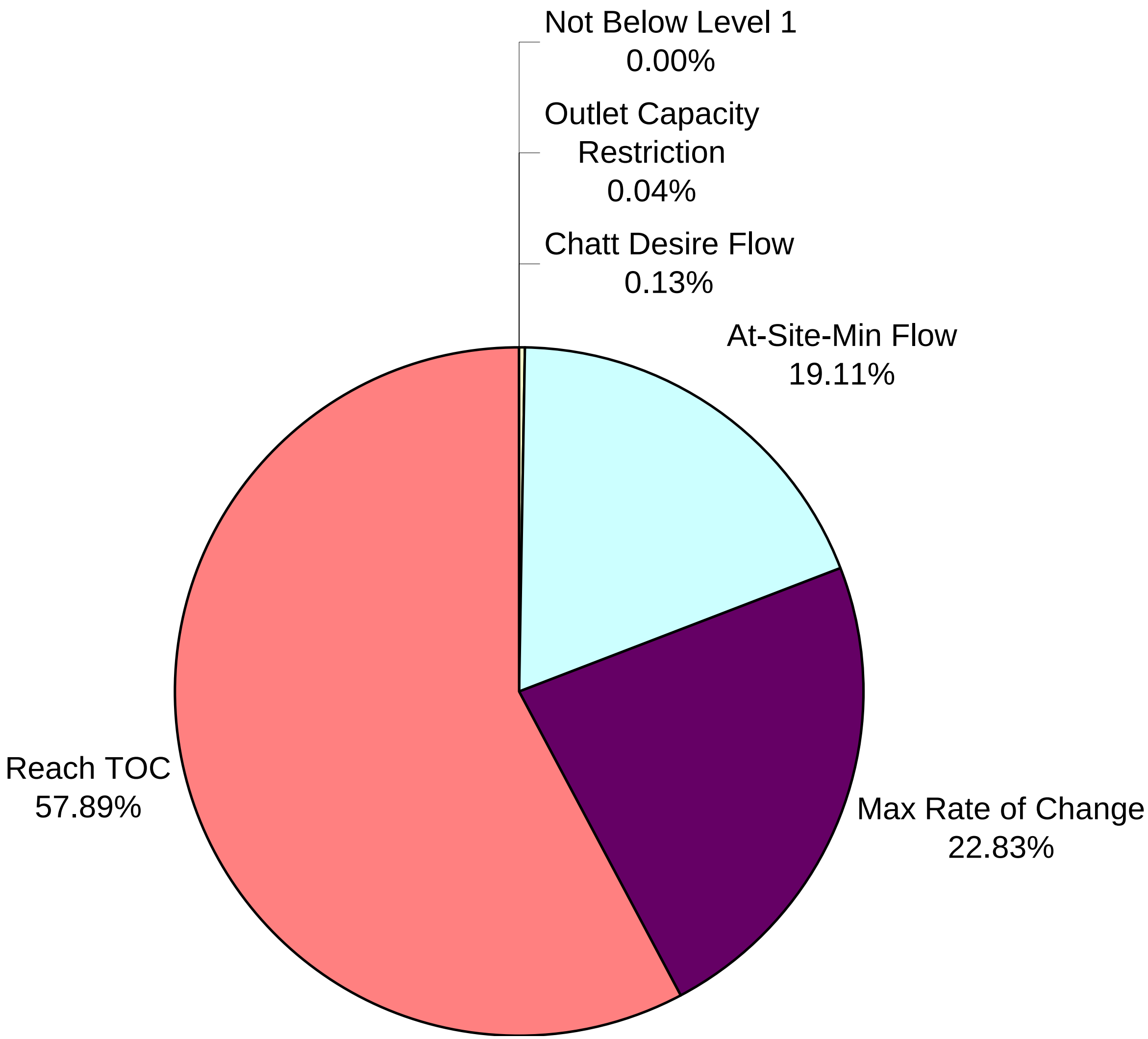


IOP Modeling Results

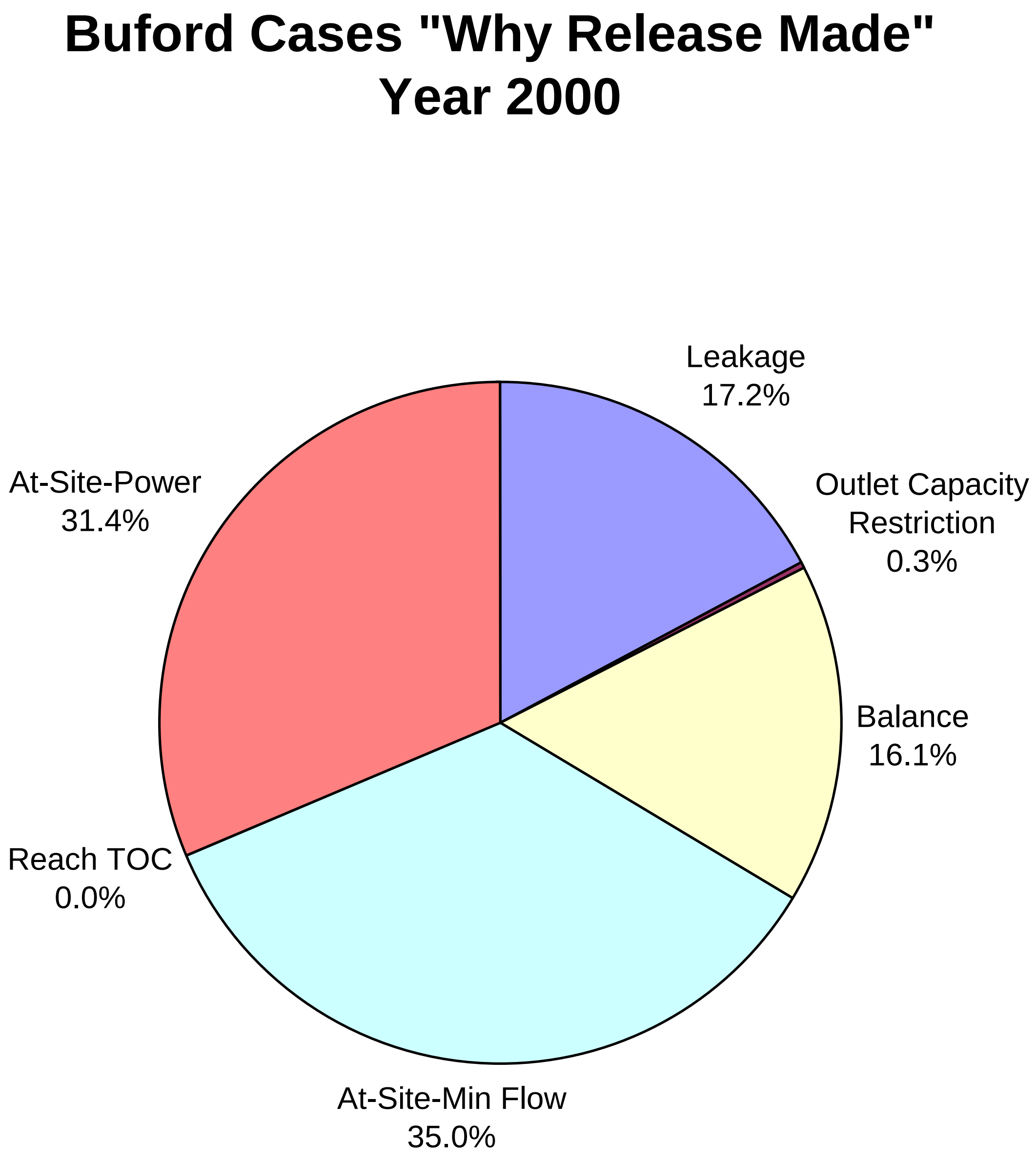


IOP Modeling Results

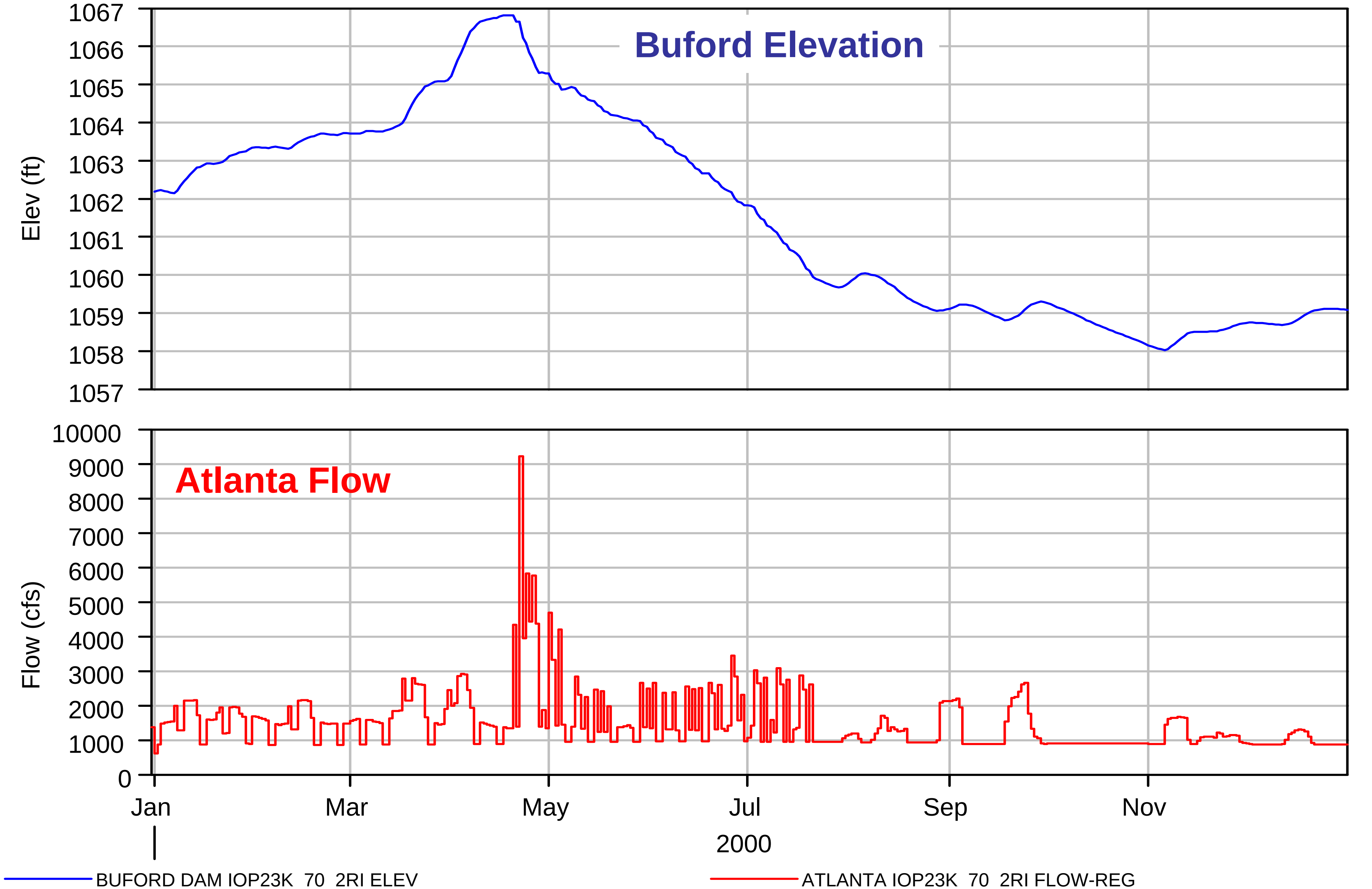
Jim Woodruff Cases "Why Release Made"
1939-2001



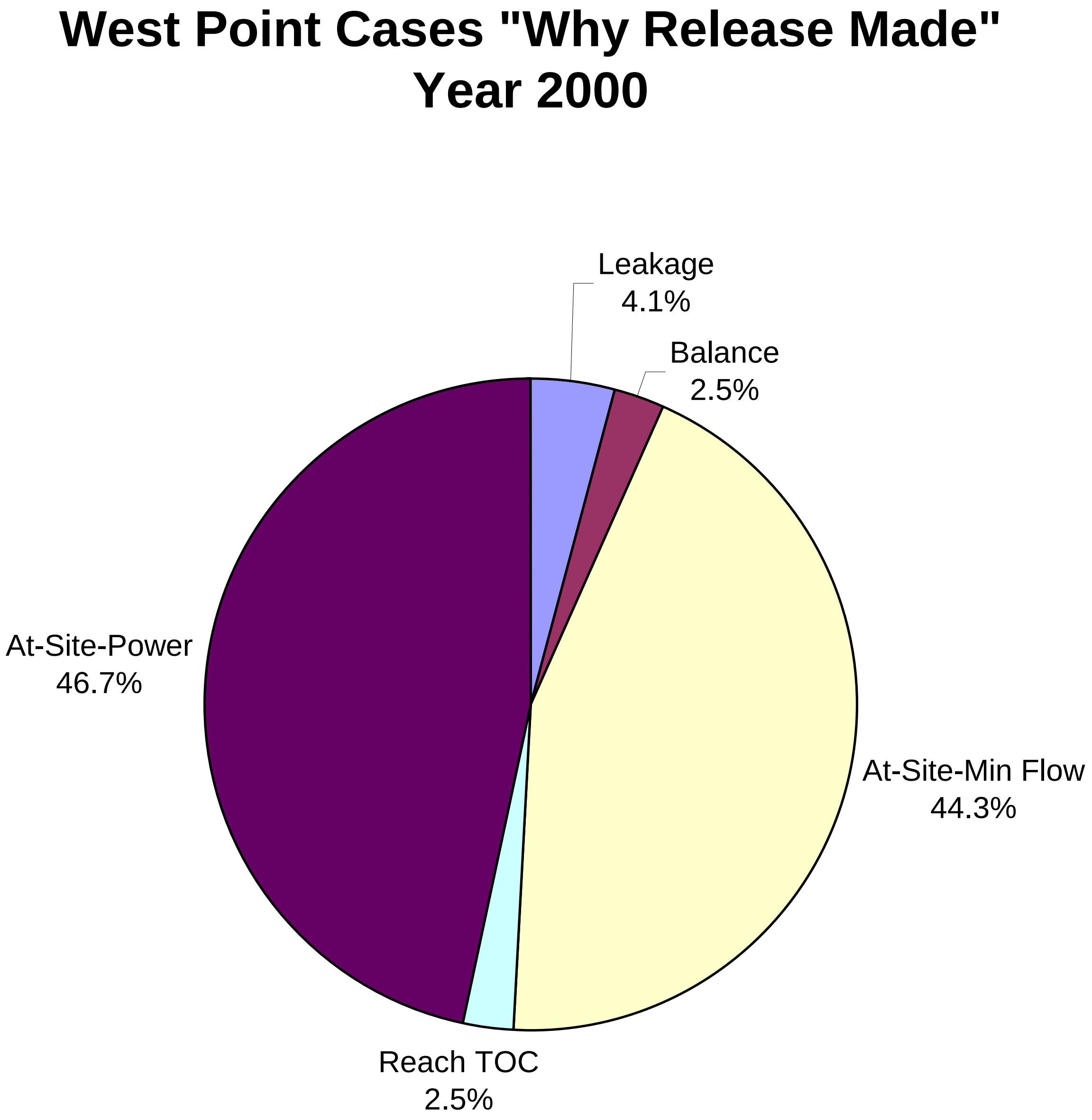
IOP Modeling Results



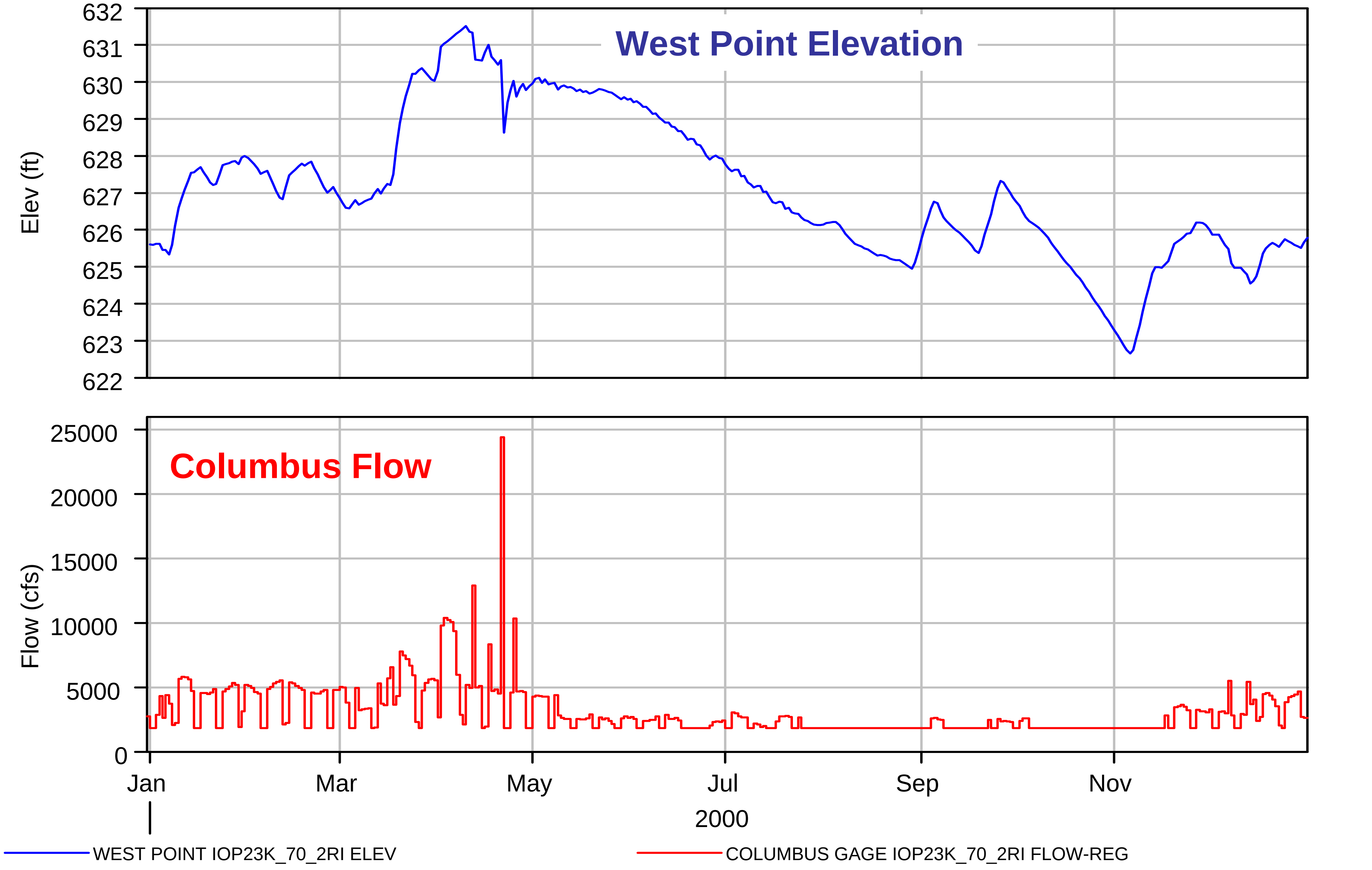
IOP Modeling Results



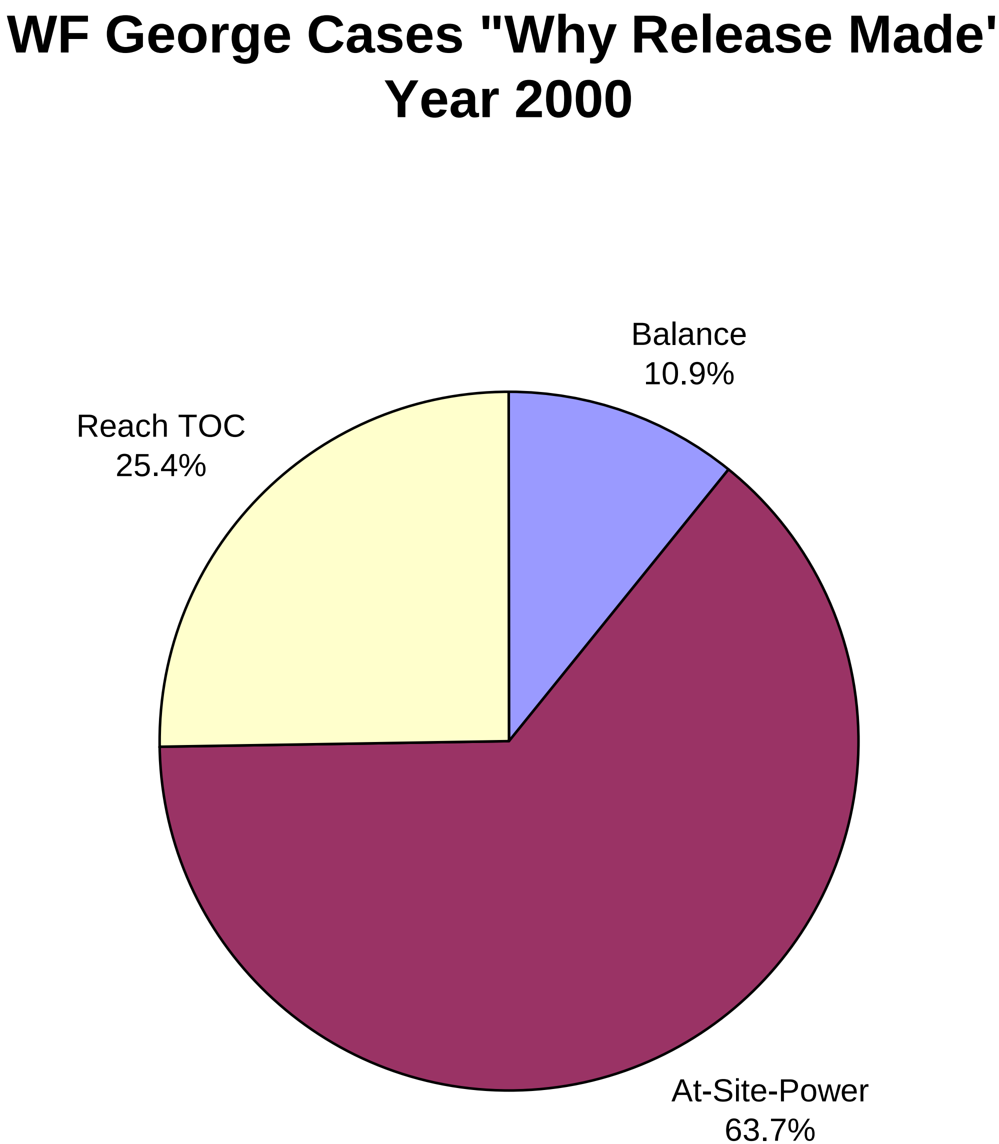
IOP Modeling Results



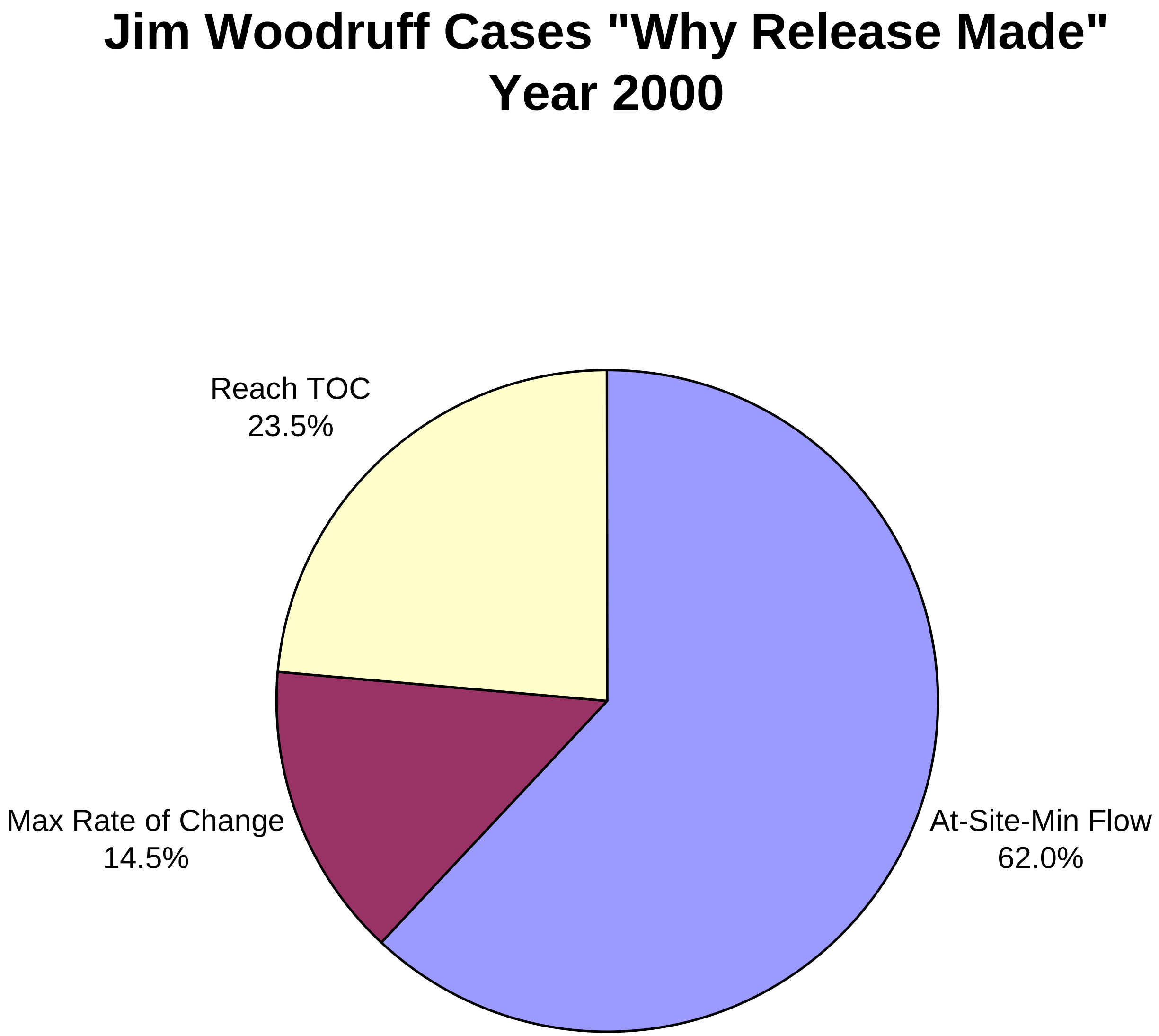
IOP Modeling Results



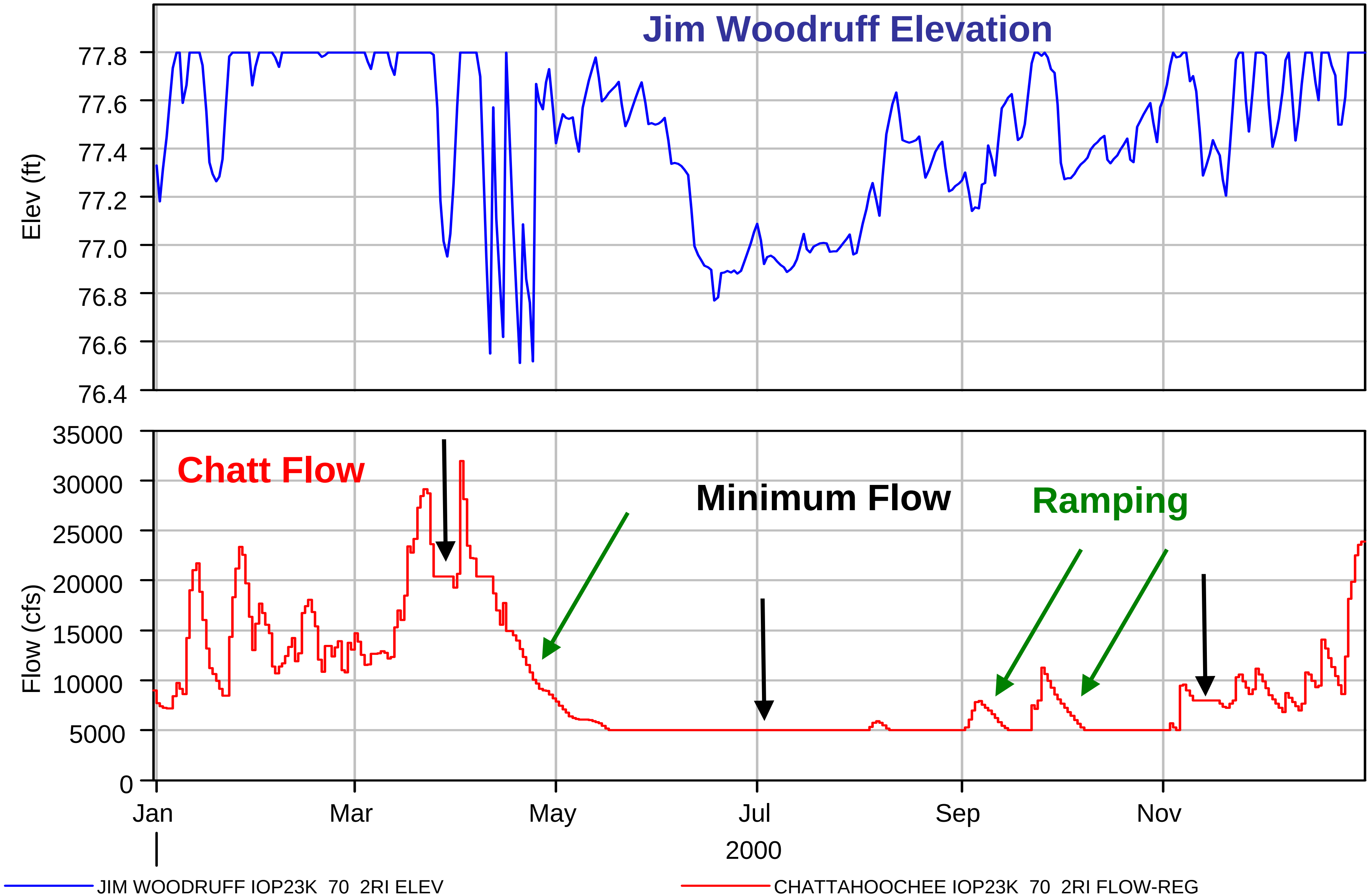
IOP Modeling Results



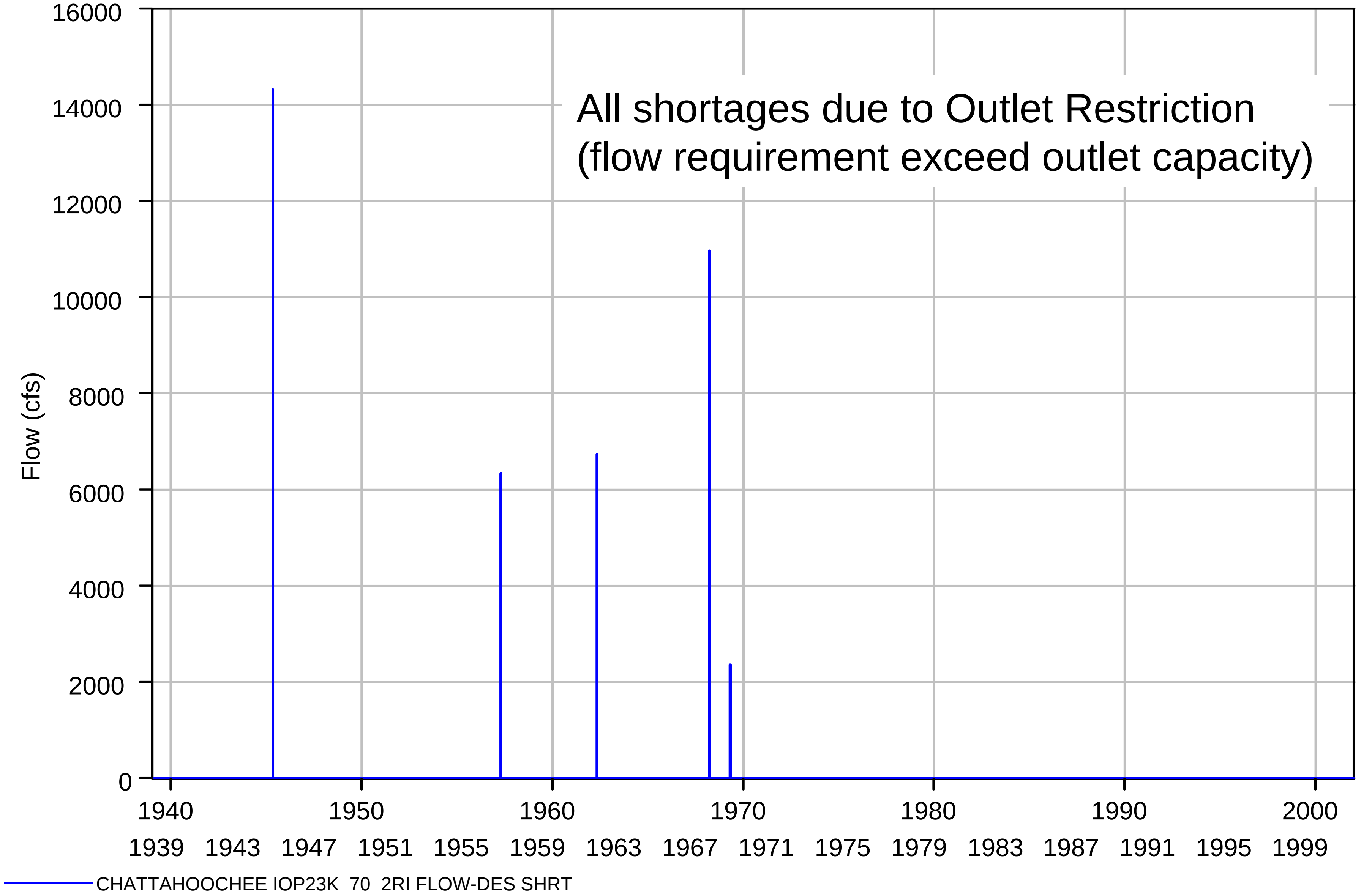
IOP Modeling Results



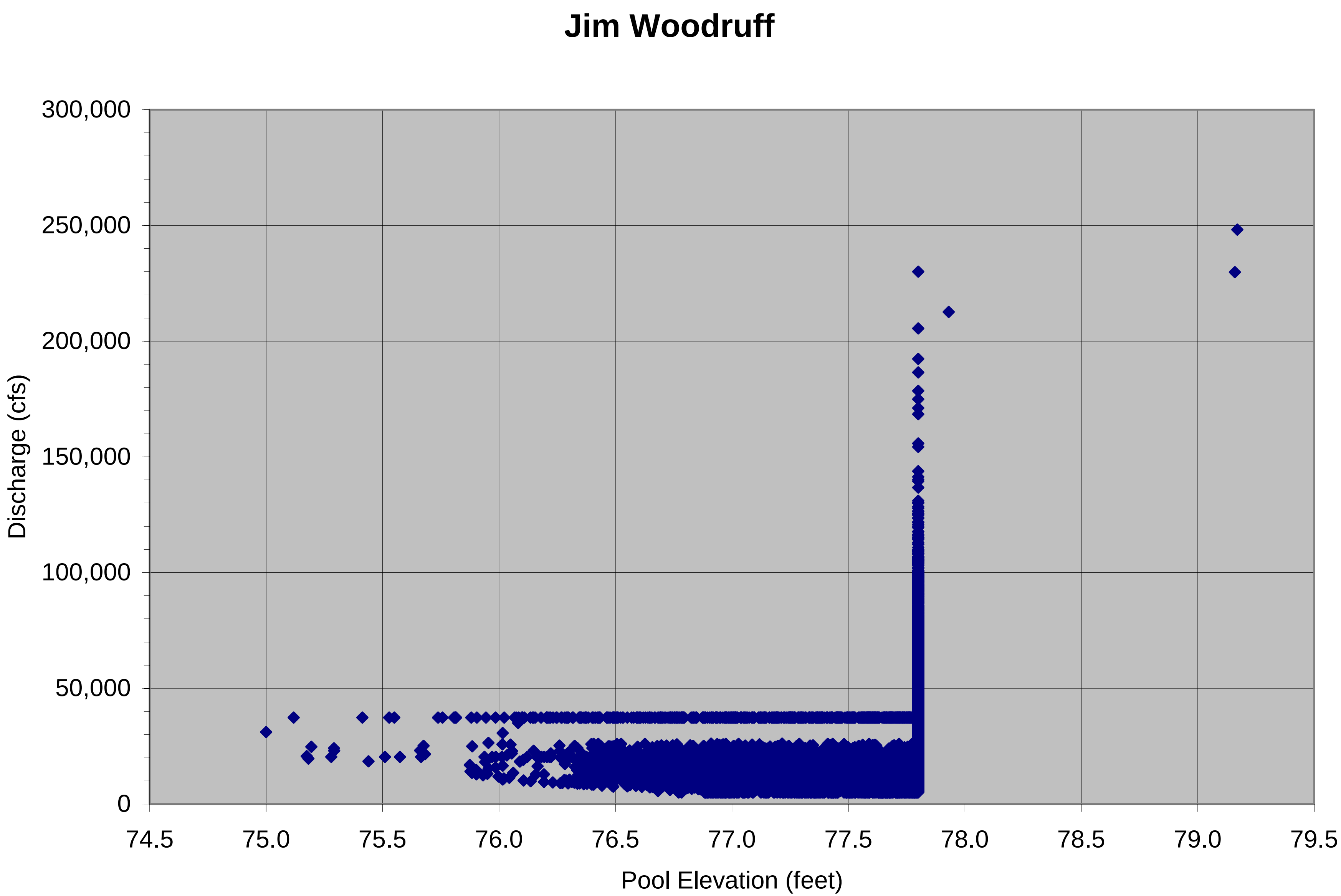
IOP Modeling Results



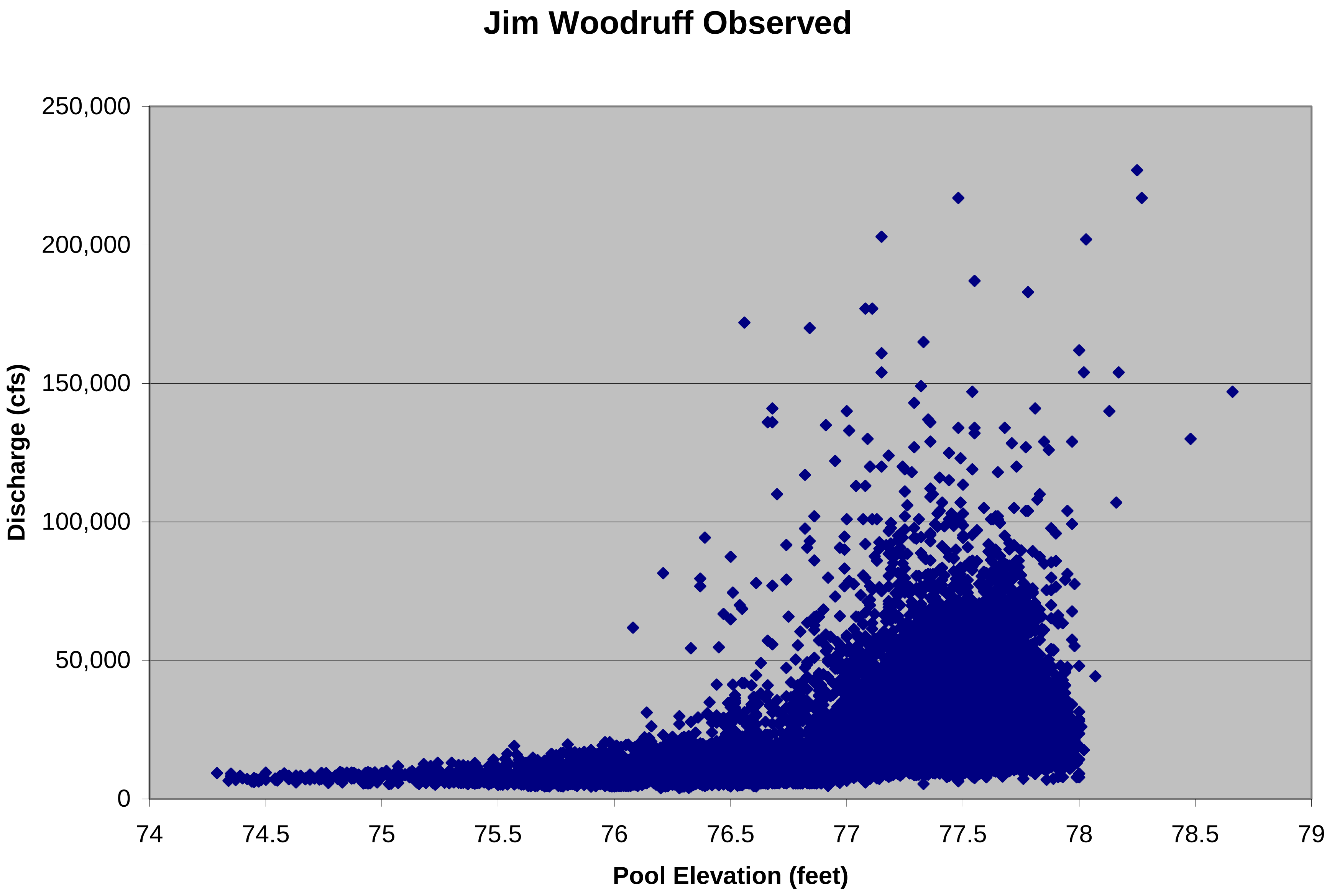
IOP Modeling Results – Chattahoochee Shortages



IOP Modeling Results



Actual


Jim Woodruff Observed
250,000
200,000
150,000
100,000
50,000
0
Discharge (cfs)
74
74.5
75
75.5
76
76.5
77
77.5
78
78.5
79
Pool Elevation (feet)

Modeling of the Interim Operation Plan

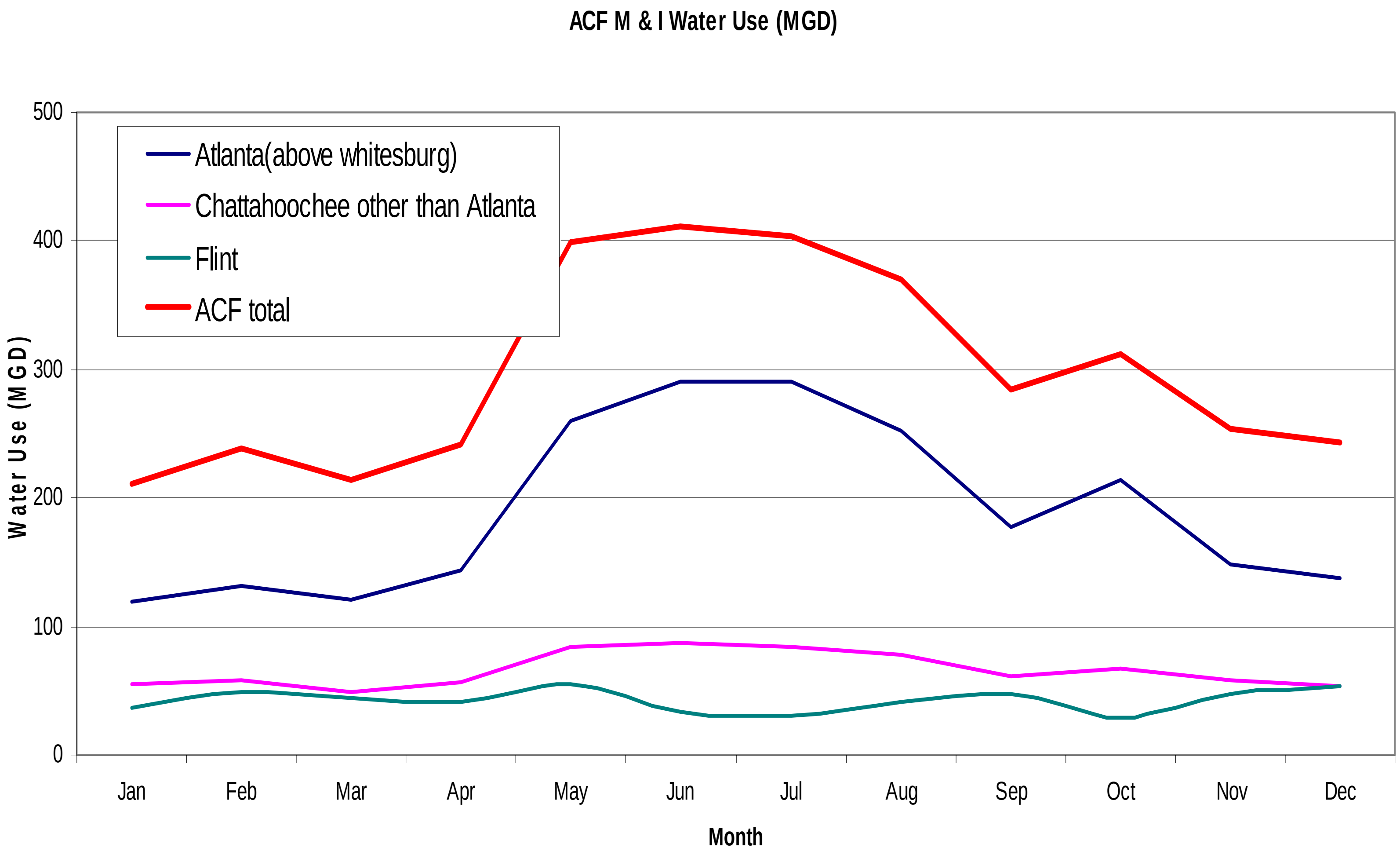
Georgia EPD

July 12, 2006 Modeling Workshop

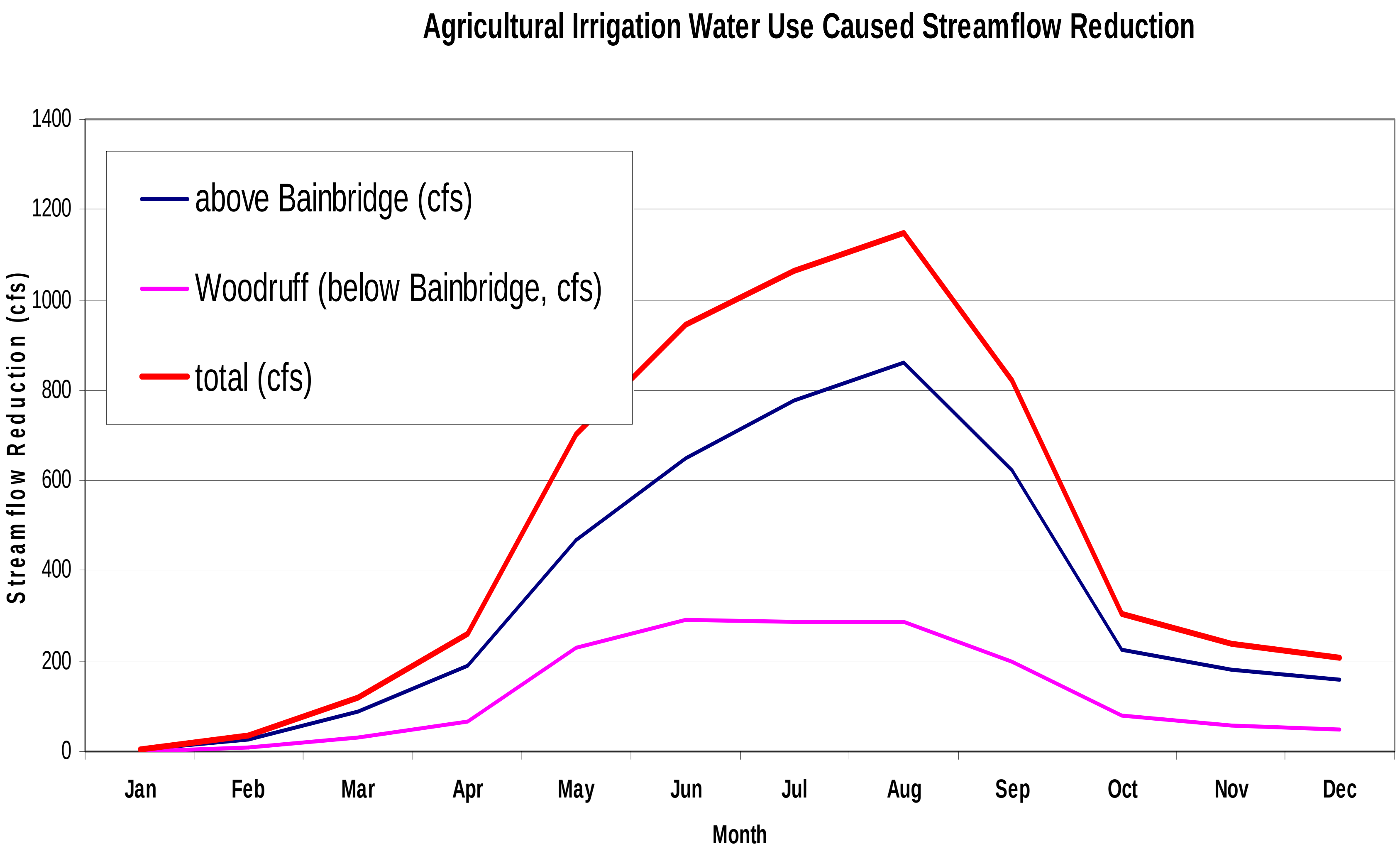
1. Model Assumptions (HEC-5)

A. Georgia Municipal & Industrial water use recorded in the year 2000
B. Georgia dry year agricultural water use from previous Georgia EPD and USGS studies
C. In-stream flow requirements at Atlanta and Columbus, Georgia
D. Revised IOP (for spawning season and non-spawning season)
E. Power generation specified by the Corps
F. Basin Inflow provided by the Corps

A. Georgia M&I Water Use (ACF)



B. Georgia Ag water use (ACF Basin)



C. In-stream Flow Requirements

- Atlanta, Georgia: 750 cfs
- Columbus, Georgia:
  - 1850 cfs
  - 1200 cfs when West Point elevation is lower than 621.6 feet MSL
- Chattahoochee, Florida: specified in the next page

D. Revised Interim Operation Plan

- Spawning season (March ~ May)
  - BI>=37400 cfs: 37400 cfs
  - 20400 cfs<BI<37400 cfs: max(20400, 0.9*BI)
  - BI<20400 cfs: max(5000, BI)
- Non-spawning season (June ~ February)
  - BI>23000 cfs: 16000 cfs
  - 8000 cfs<BI<23000 cfs: max(8000, 0.7*BI)
  - BI<8000 cfs: max(5000, BI)

E. Firm Power Generation (hrs)

Action Zones	Lake Lanier	West Point	W.F. George
Zone 1	3	4	4
Zone 2	2	2	2
Zone 3	2	2	2
Zone 4	0	0	0

E. Power Generation Assumptions (continued)

- Lanier in Georgia model:
  - PC 8 .0 .697 .698 .826 .827 .879 .880 1.0
  - PF 8 .001 .001 .083 .083 .083 .083 .125 .125
- Lanier in Corps model:
  - PC 8 0 .796 .797 .862 .863 .896 .897 1.0
  - PF 8 .000 .000 .083 .083 .083 .083 .125 .125

E. Power Generation Assumptions (continued)

- West Point in Georgia model:
  - PC 8 .0 .369 .370 .560 .561 .687 .688 1.0
  - PF 8 .001 .001 .083 .083 .083 .083 .167 .167
- West Point in Corps model:
  - PC 8 0 .609 .610 .758 .759 .836 .837 1.0
  - PF 8 .000 .000 .083 .083 .083 .083 .167 .167

E. Power Generation Assumptions (continued)

- W.F. George in Georgia model:
  - PC 8 .0 .248 .249 .518 .519 .785 .786 1.0
  - PF 8 .001 .001 .083 .083 .083 .083 .167 .167
- W.F. George in Corps model:
  - PC 8 0 .309 .310 .643 .644 .818 .819 1.0
  - PF 8 .000 .000 .083 .083 .083 .083 .167 .167

F. Basin Inflow

- Method of developing Basin Inflow
- Data of developing Basin Inflow
- Time series of Basin Inflow
- Consistence with unimpaired flow

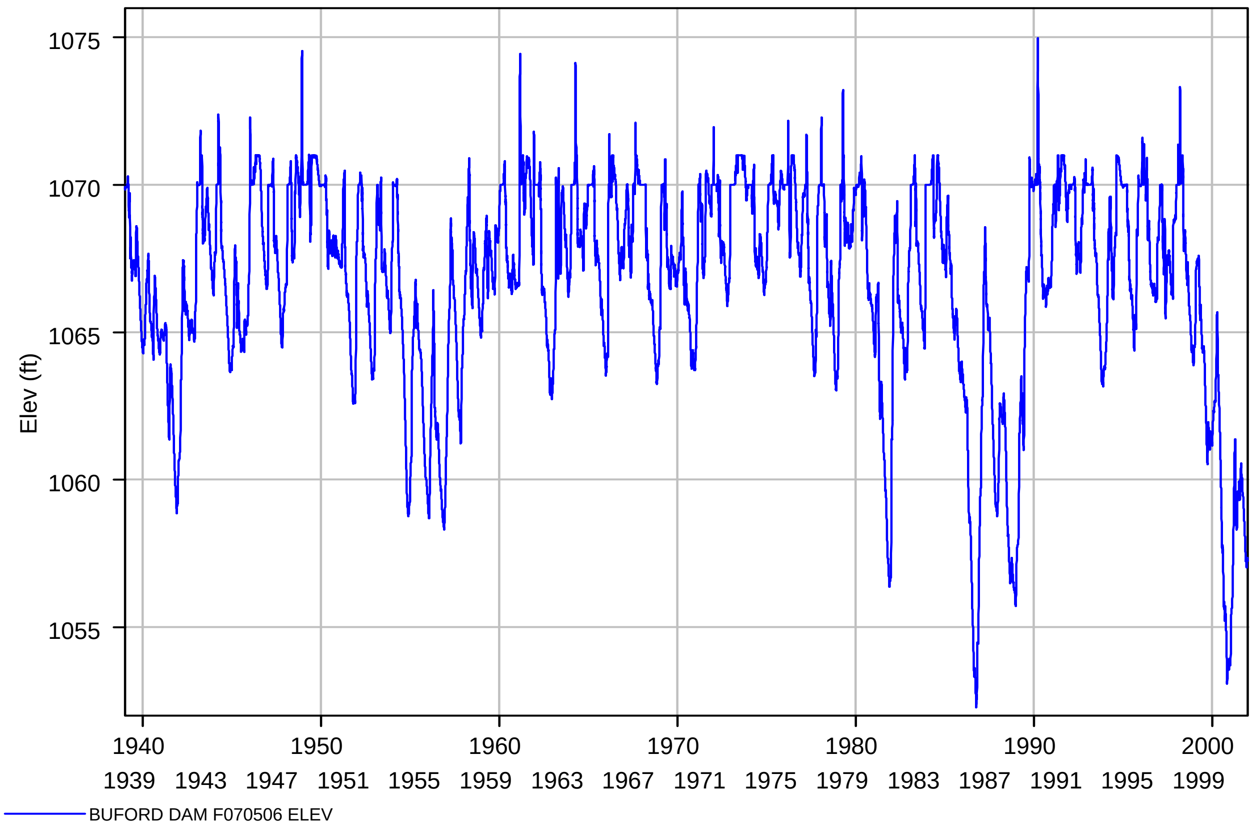
2. STELLA Model Assumption (Georgia model)

- Georgia STELLA model has the same assumptions as Georgia HEC-5 model
- US Fish & Wildlife Service STELLA model has different assumptions (see summary of last workshop). Note power assumption may be different from other models.

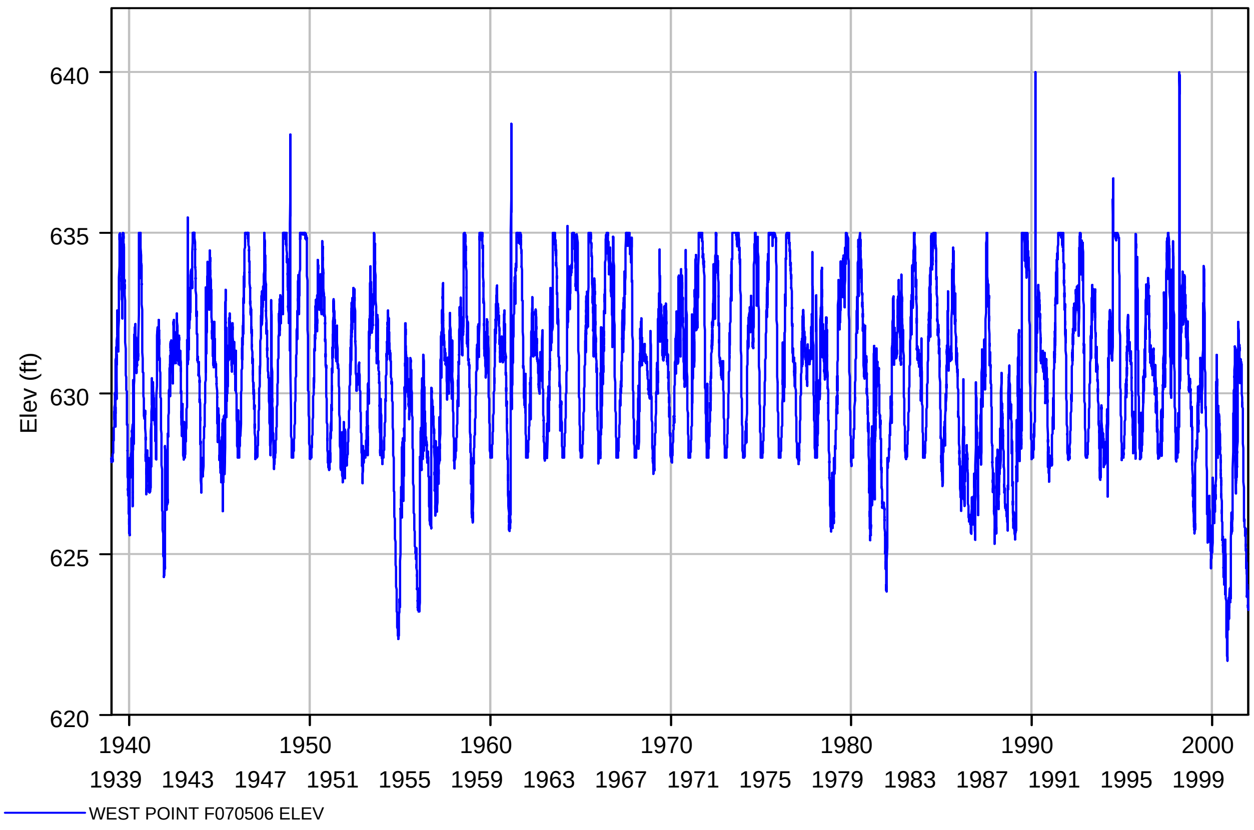
3. Model Results

- Georgia HEC-5 model
- Georgia STELLA model
- USFWS STELLA model

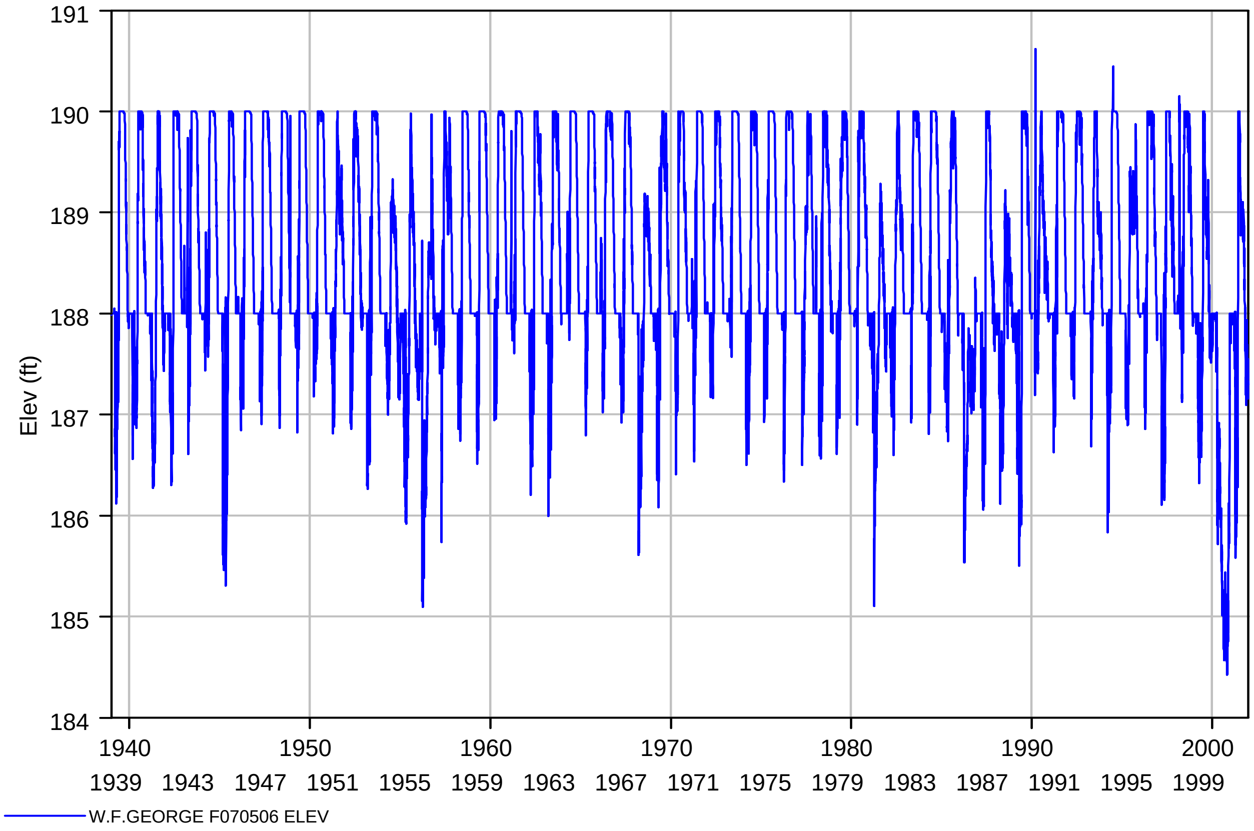
GaEPD HEC-5 Results
Lanier Elevation



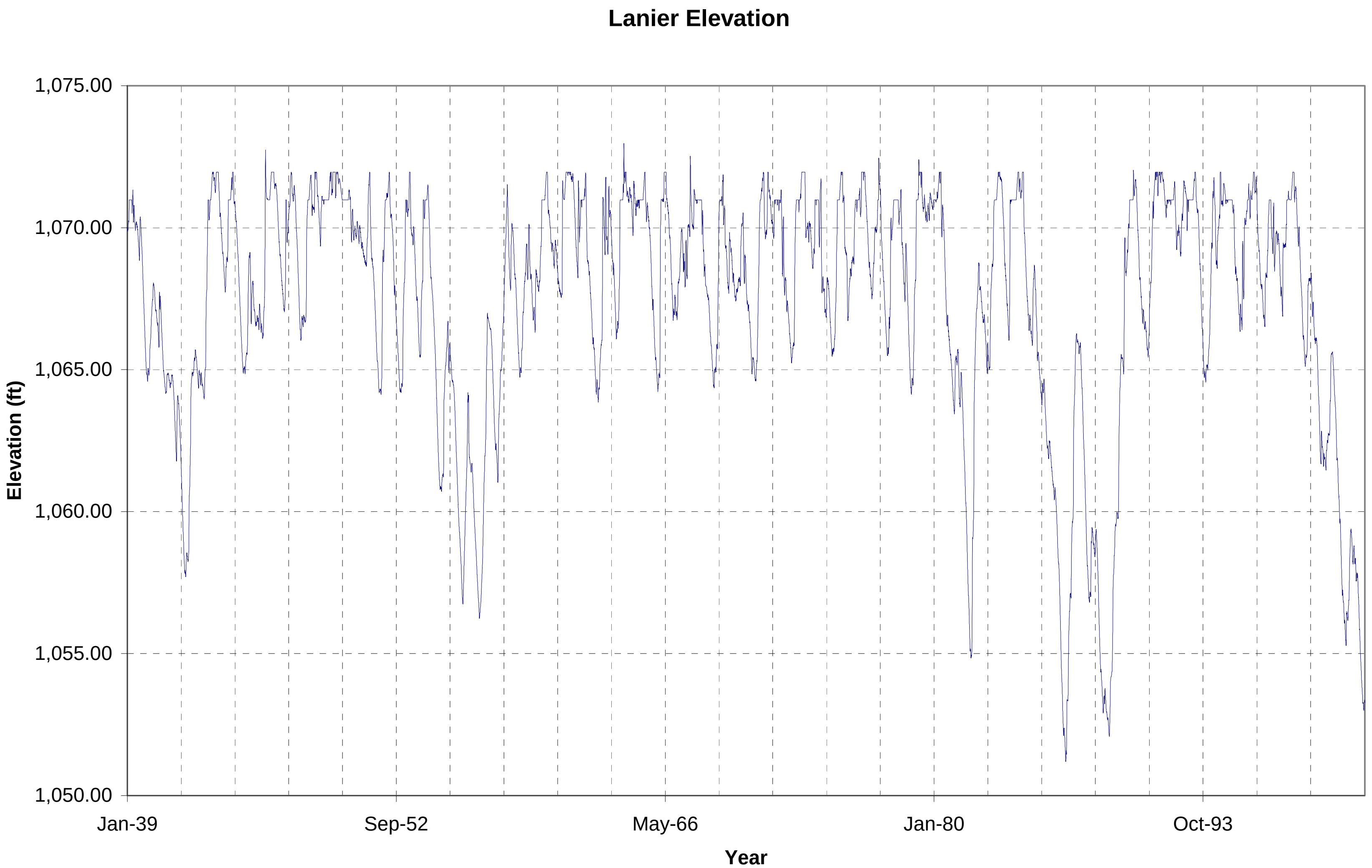
GaEPD HEC-5 Results
West Point Elevation



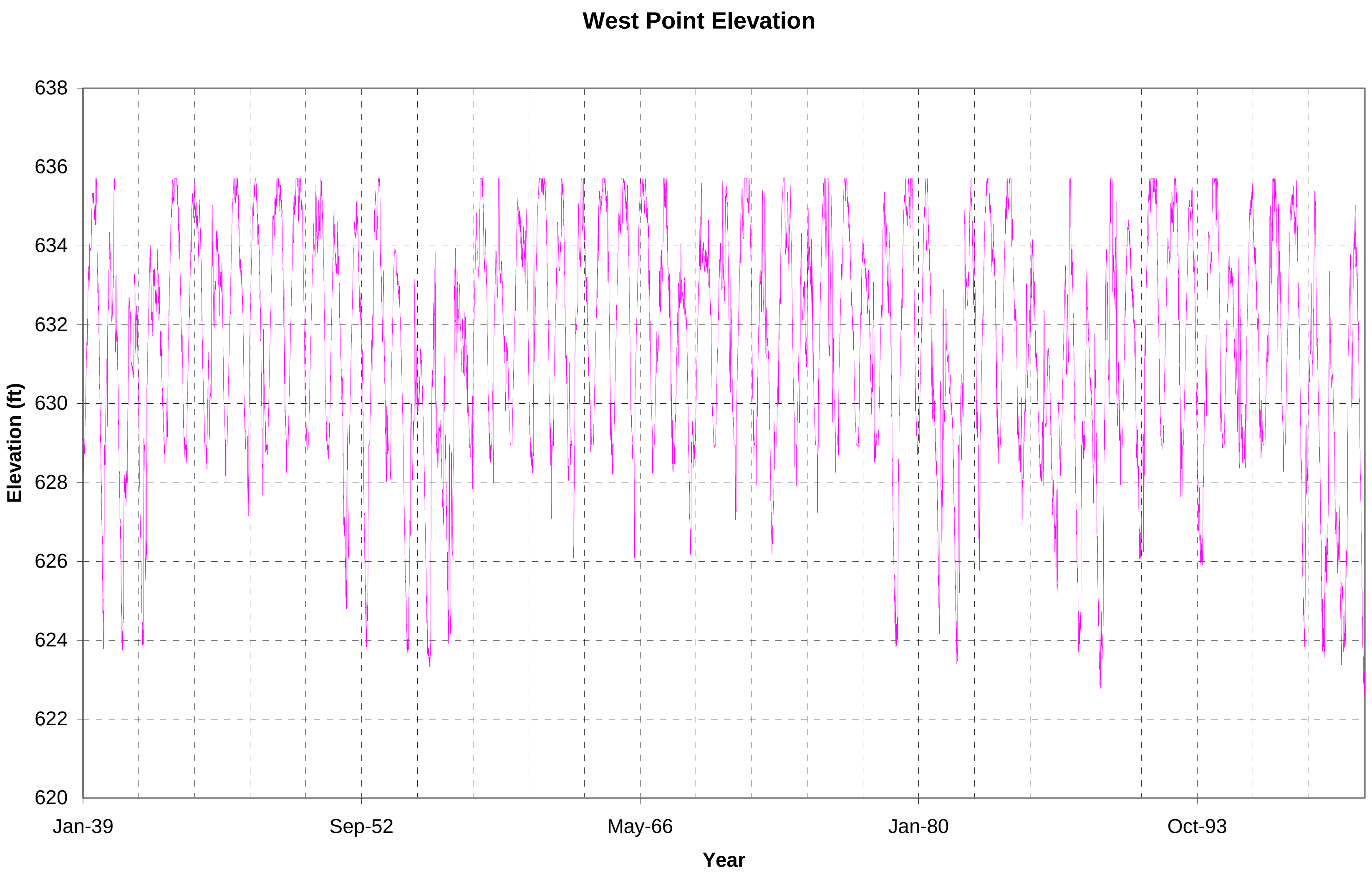
GaEPD HEC-5 Results W.F. George Elevation



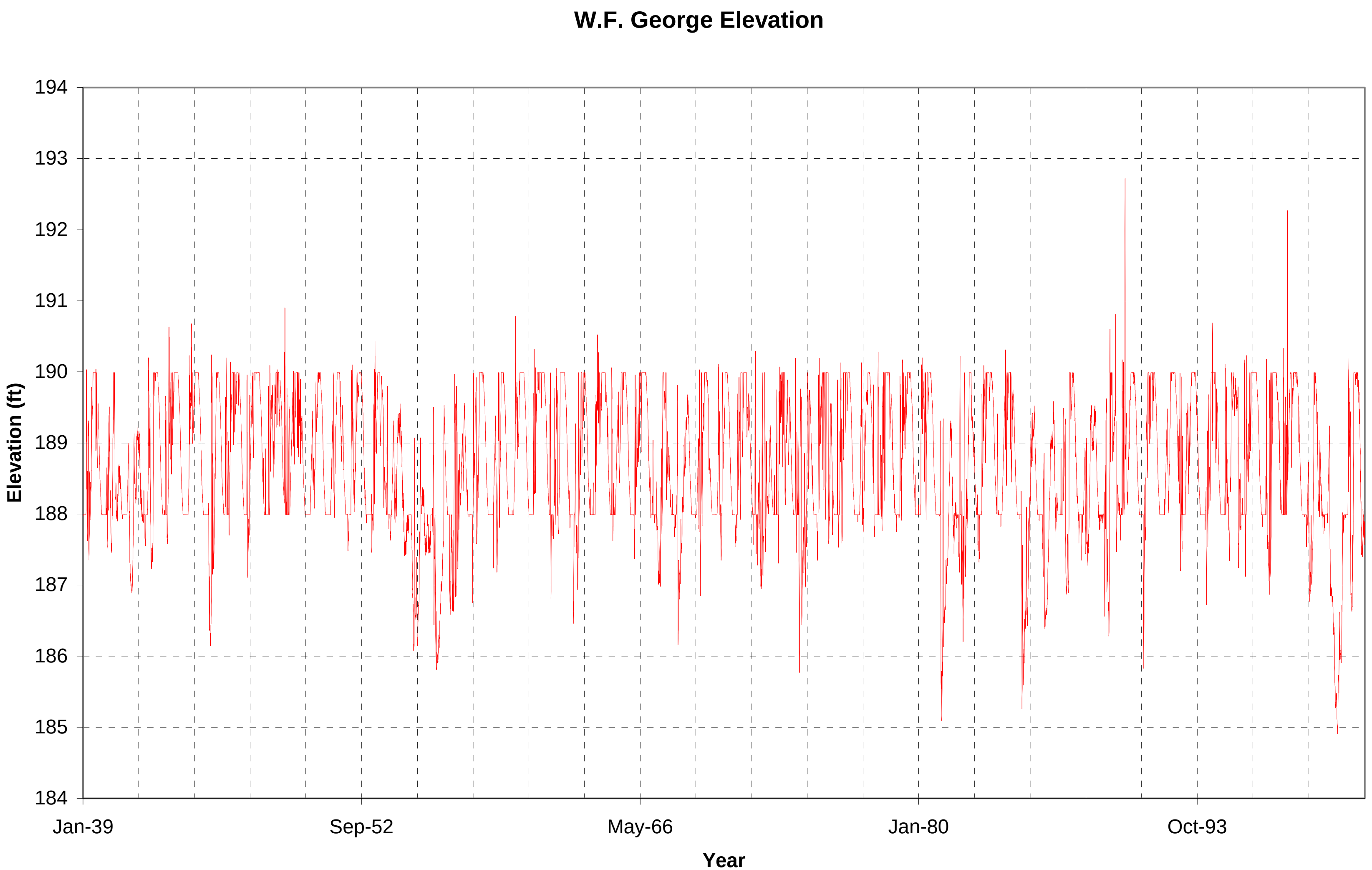
GaEPD STELLA Results



GaEPD STELLA Results



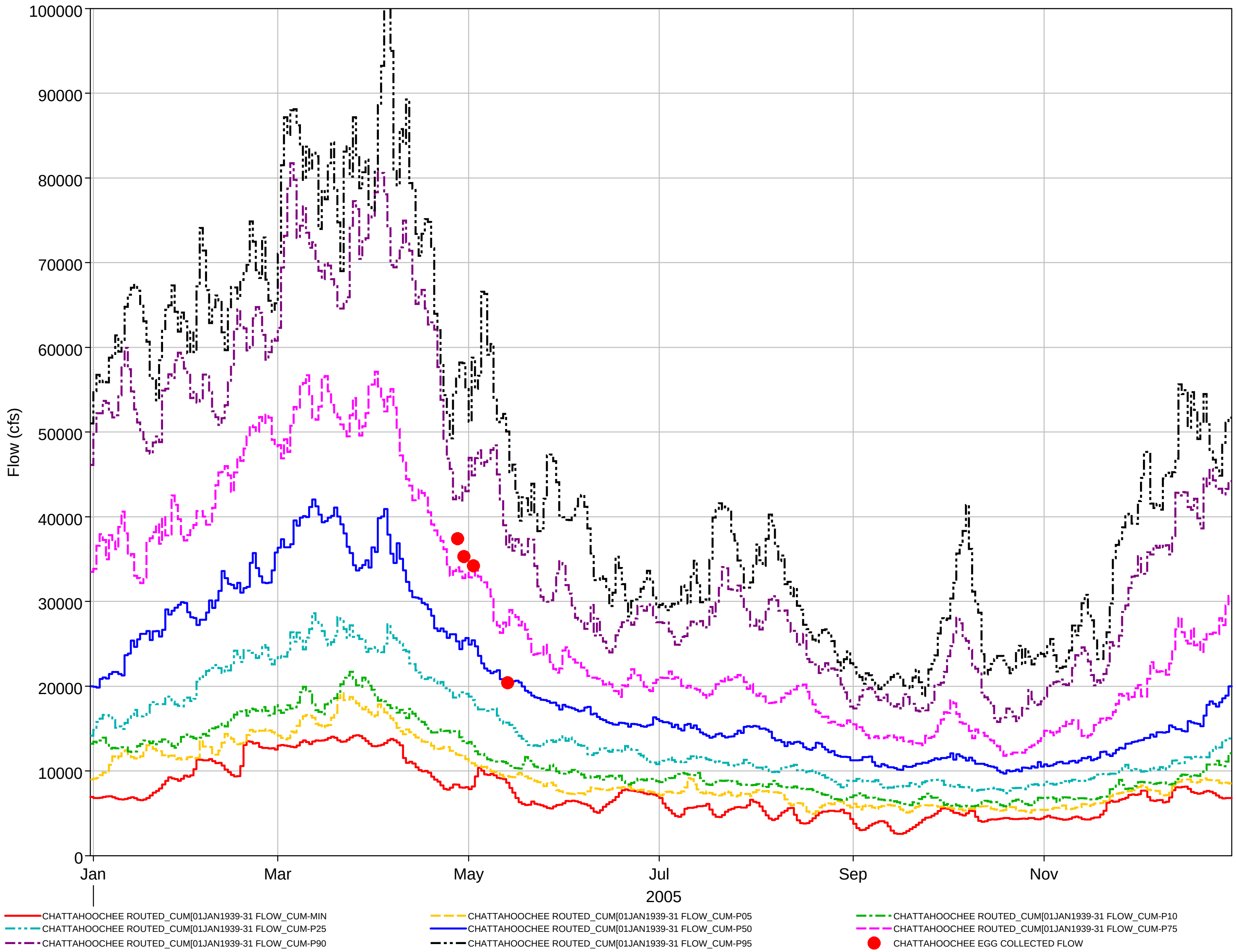
GaEPD STELLA Results



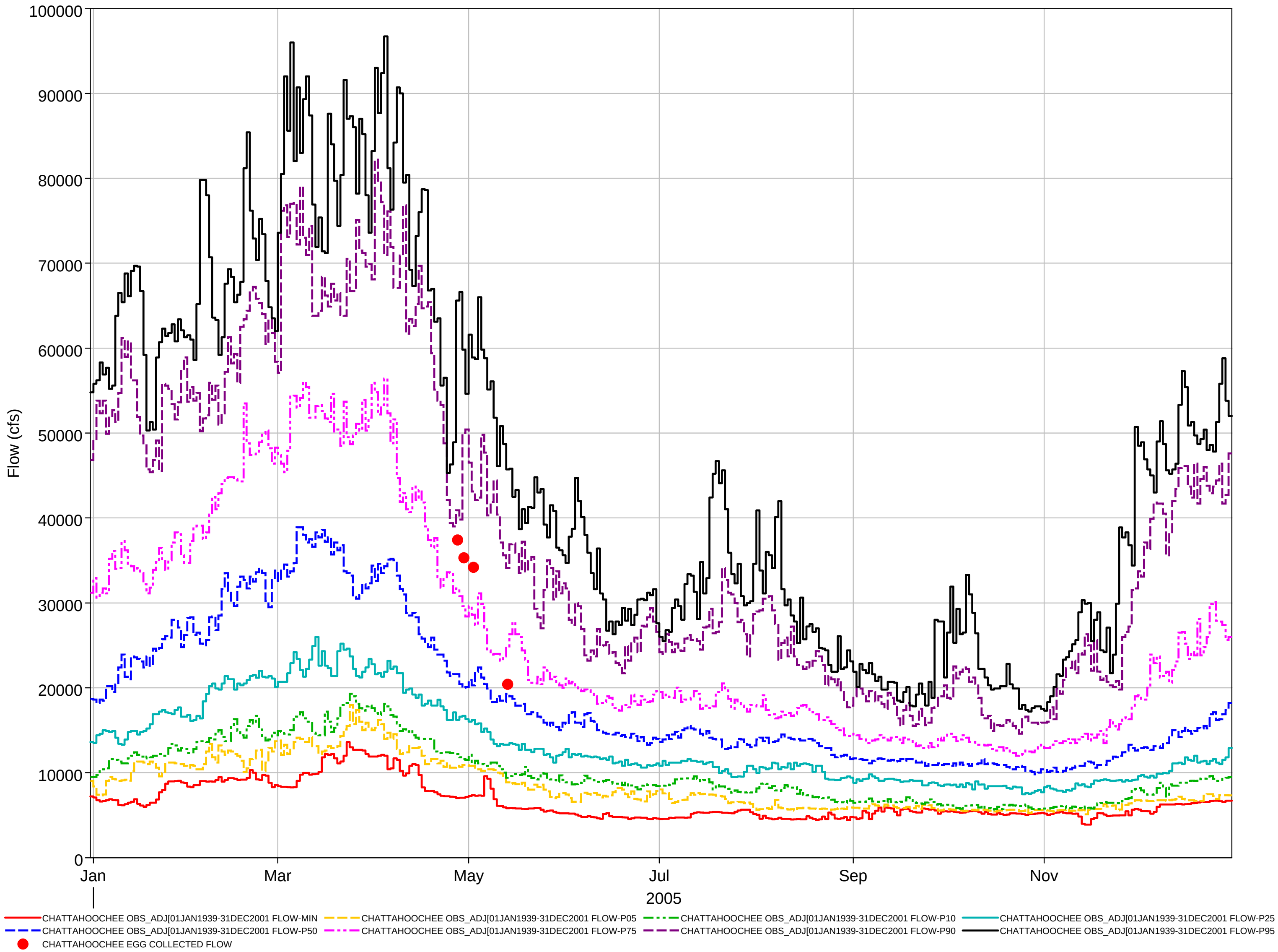
4. Hydrological Basis for IOP

A. Flow rates (corresponding to the 4 days of sturgeon egg-collection in 2005) at Chattahoochee, Florida in the background of exceedance levels of
   I. Cumulative unimpaired flow
   II. Observed flow
   III. Basin Inflow

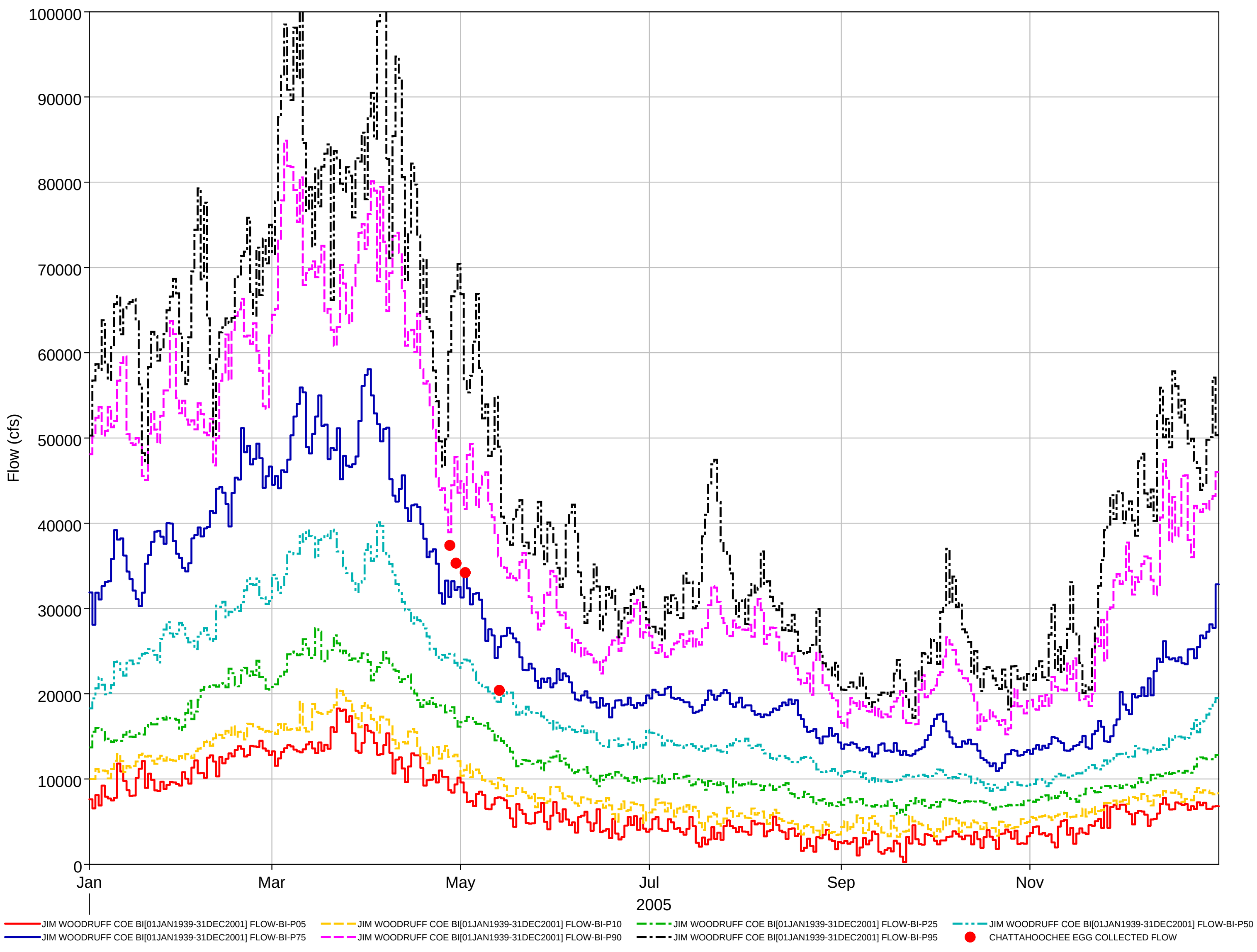
B. This year's data points vs. exceedance levels

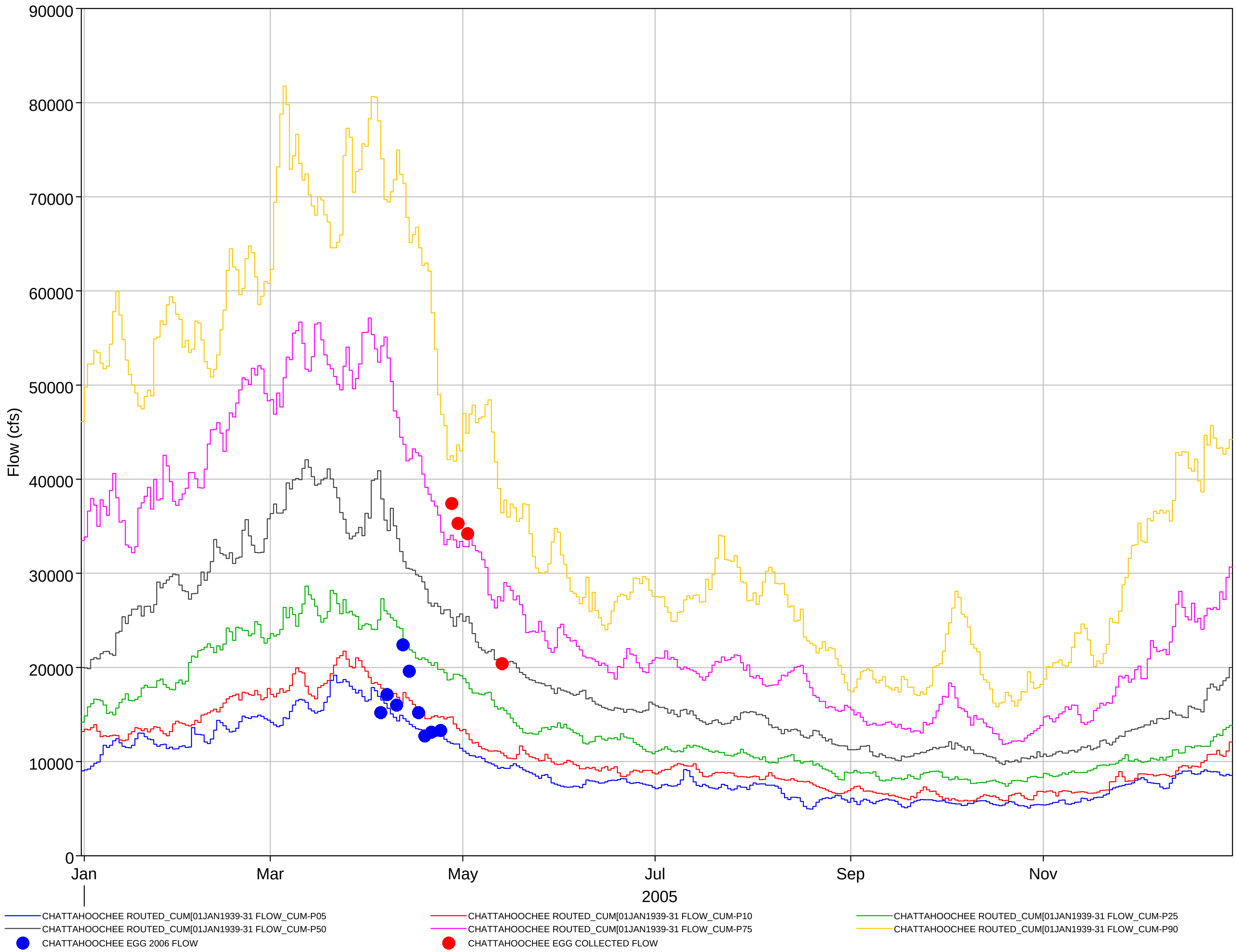


Flow (cfs)
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Jan
Mar
May
Jul
Sep
Nov
2005
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-MIN
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P05
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P10
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P25
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P50
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P75
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P90
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P95
CHATTAHOOCHEE EGG COLLECTED FLOW



Flow (cfs)
100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Jan
Mar
May
Jul
Sep
Nov
2005
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-MIN
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P05
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P10
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P25
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P50
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P75
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P90
CHATTAHOOCHEE OBS_ADJ[01JAN1939-31DEC2001 FLOW-P95
CHATTAHOOCHEE EGG COLLECTED FLOW


100000
90000
80000
70000
60000
50000
40000
30000
20000
10000
0
Flow (cfs)
Jan
Mar
May
Jul
Sep
Nov
2005
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P05
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P10
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P25
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P50
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P75
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P90
JIM WOODRUFF COE BI[01JAN1939-31DEC2001] FLOW-BI-P95
CHATTAHOOCHEE EGG COLLECTED FLOW



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Flow (cfs)
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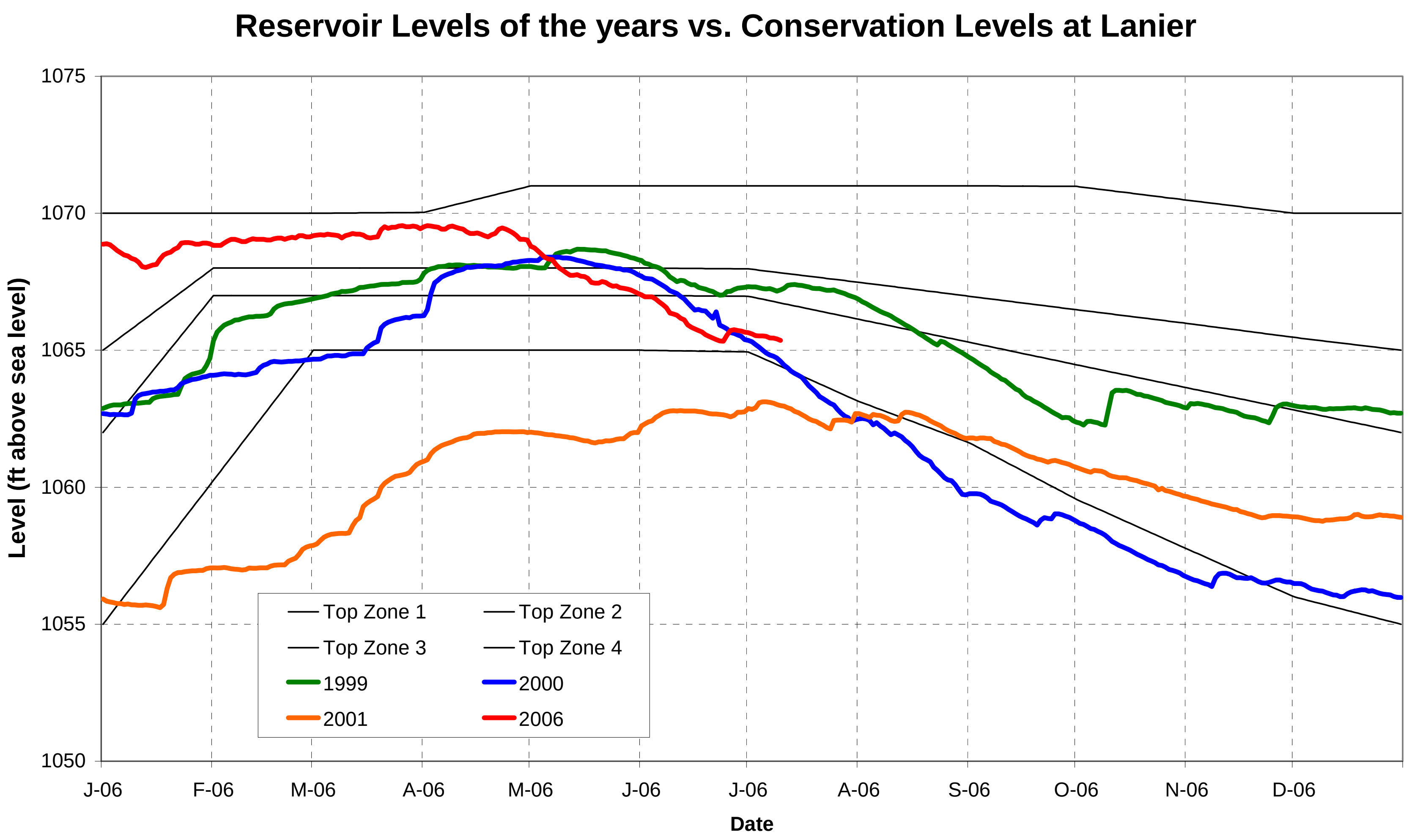
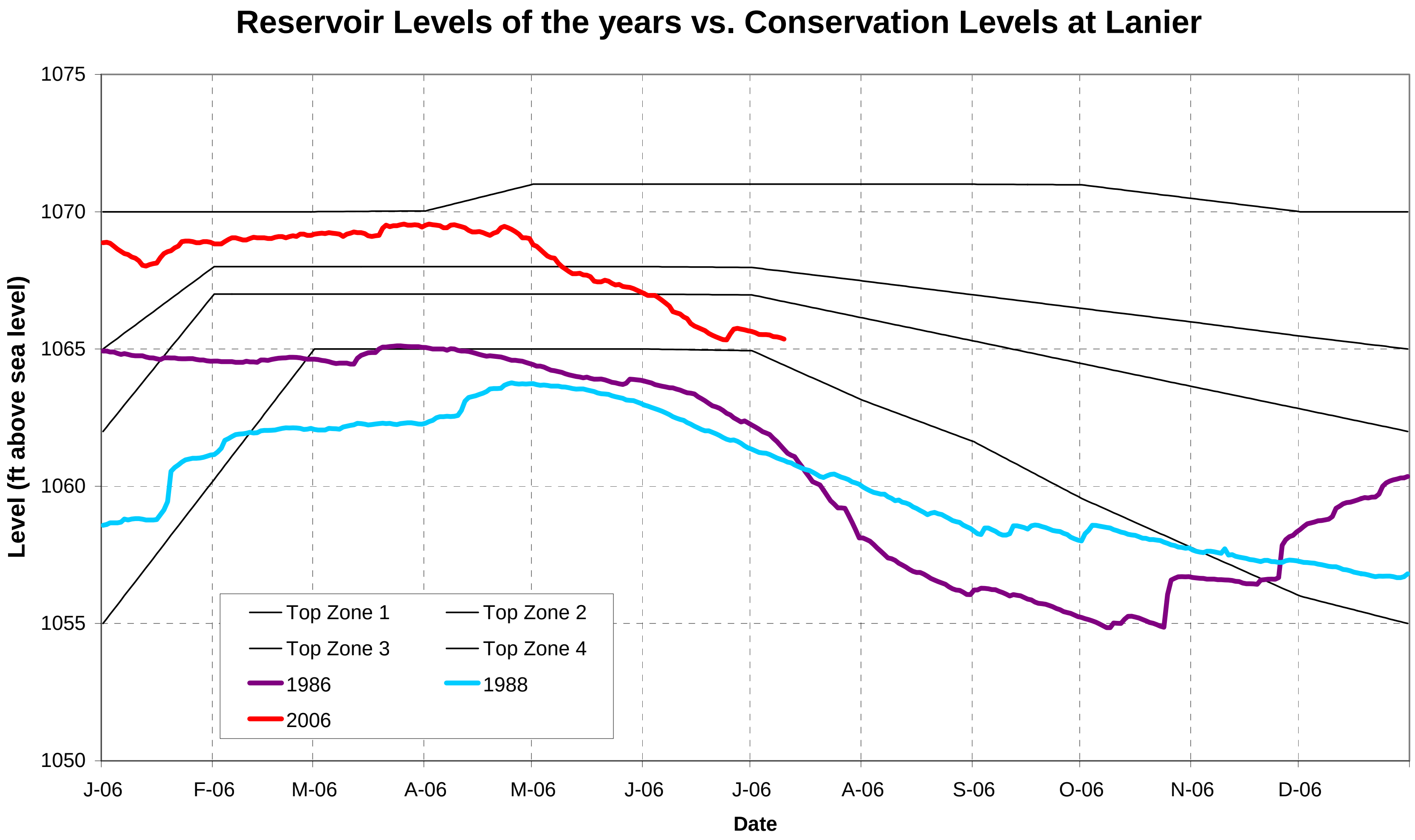
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P05
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P10
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P25
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P50
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P75
CHATTAHOOCHEE ROUTED_CUM[01JAN1939-31 FLOW_CUM-P90
CHATTAHOOCHEE EGG 2006 FLOW
CHATTAHOOCHEE EGG COLLECTED FLOW

5. Impacts of the IOP



5. Impacts of the IOP (continued)



Jim Woodruff Section 7 Consultation - Follow-on Technical Modeling Workshop, Columbus GA

George F. McMahon, Ph.D., PE, D.WRE

Additional topics for discussion

- Power guide curve simulation in HEC-5
- New Lanier turbines/generators
- Ramp-up/ramp-down rate limits
- Woodruff stability considerations
- Seasonal rule curves, guide curves and spawning releases

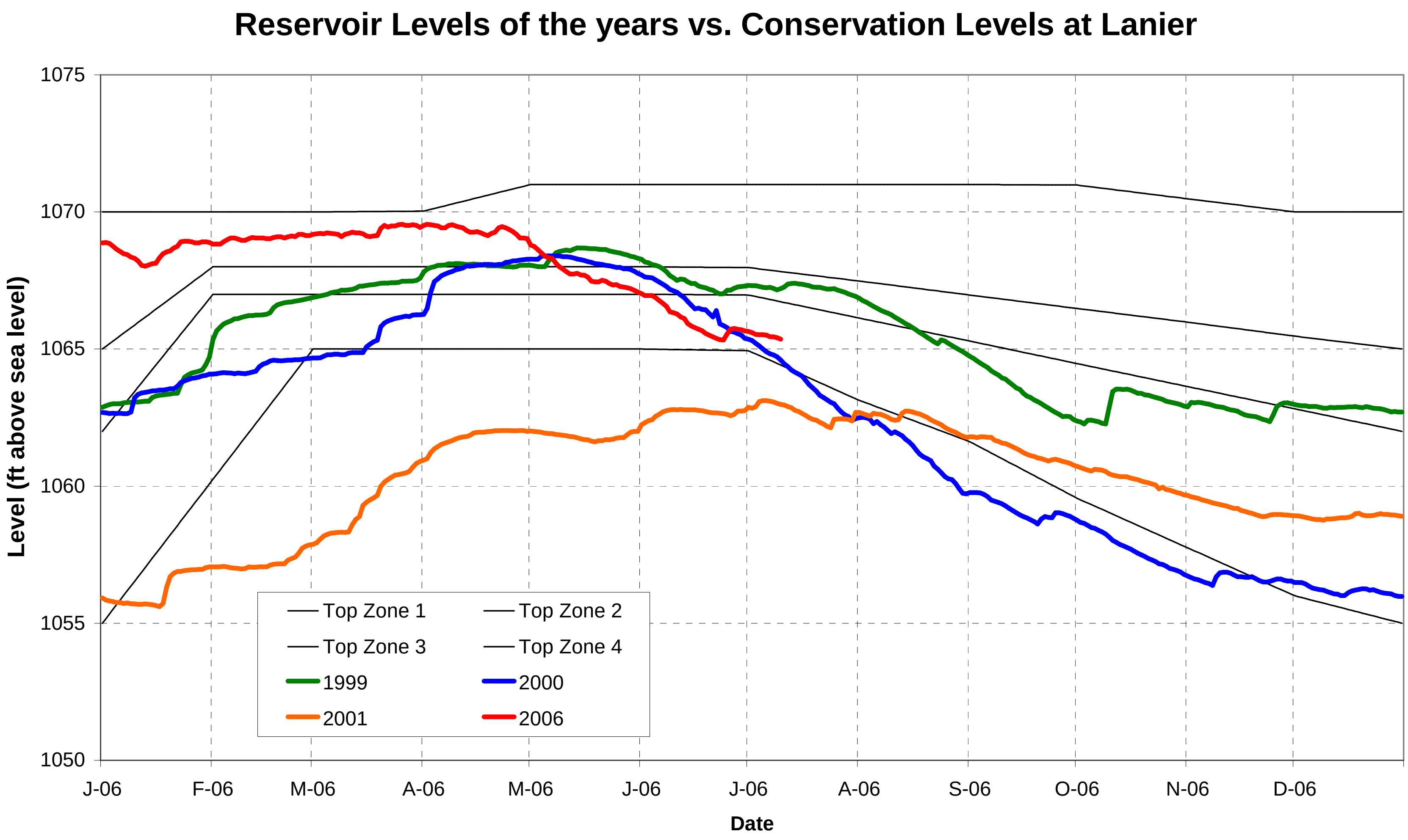
Power guide curve simulation in HEC-5

Corps of Engineers
Daily Minimum Hours of Generation – 12 months

Current Model Setting			
Zone	Buford	West Point	WF George
1	3	4	4
2	2	2	2
3	2	2	2
4	0	0	0

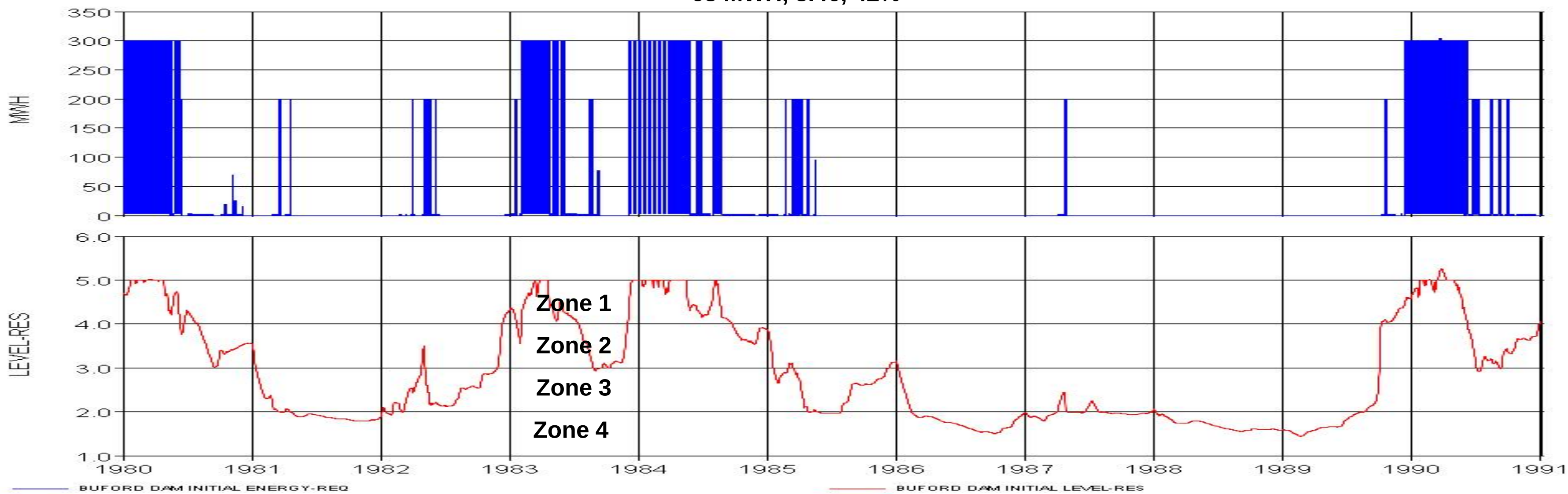
Source: Col. Taylor's letter to Carol Couch, 12 June 2006

Lanier rule and guide curves

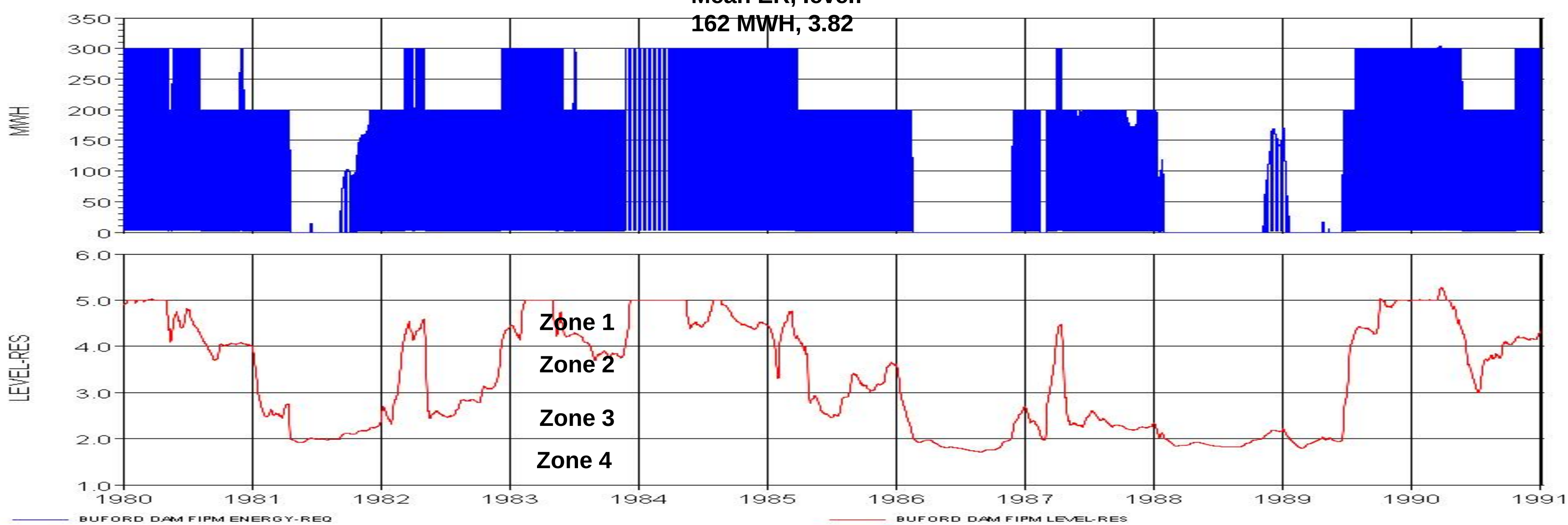


USACE INTERIM.DAT/ARC FIPM.DAT - Lanier

Mean ER, level, % FIPM:
68 MWH, 3.46, 42%

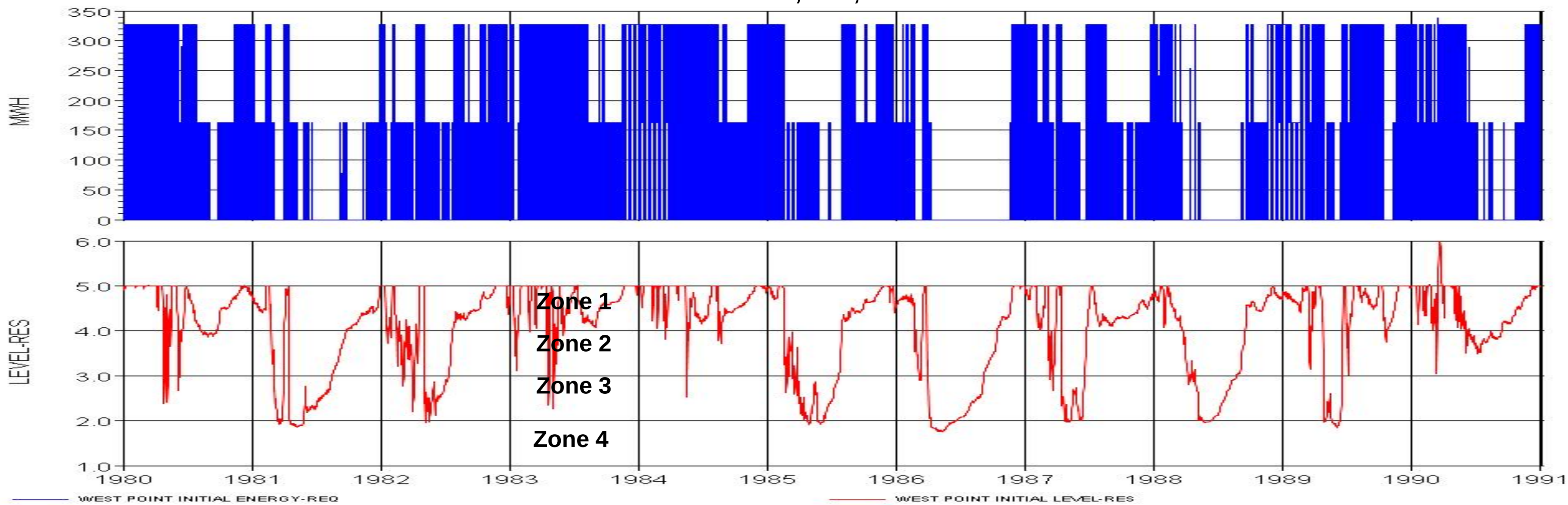


Mean ER, level:
162 MWH, 3.82

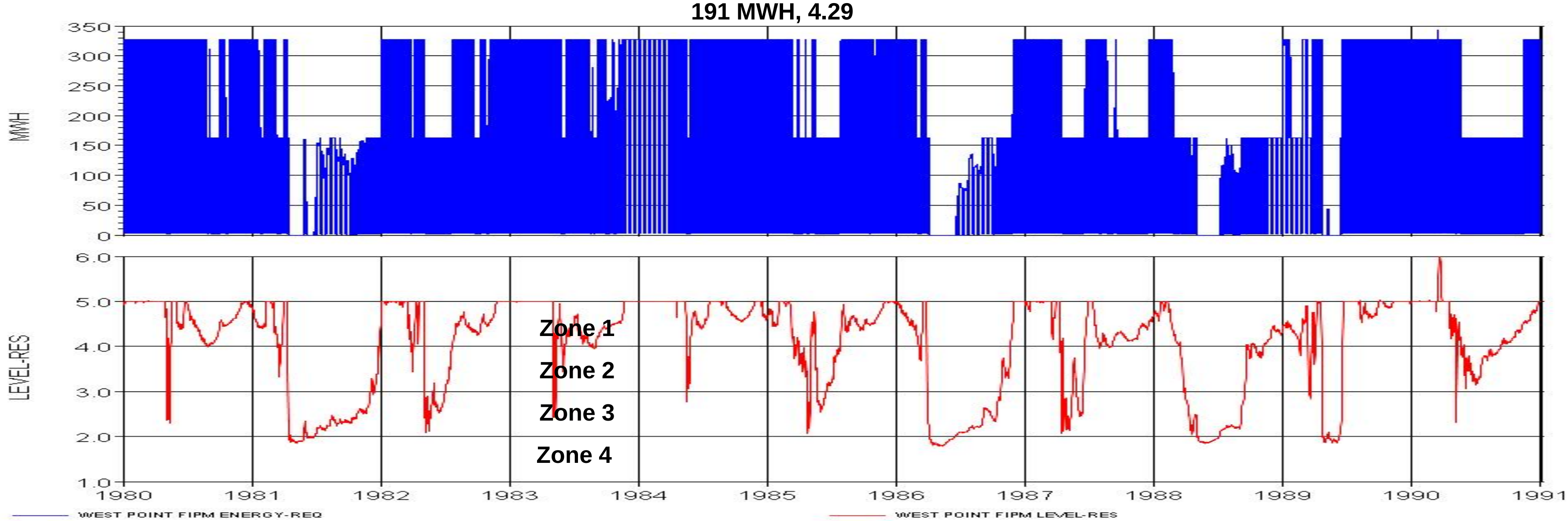


USACE INTERIM.DAT/ARC FIPM.DAT – West Point

Mean ER, level, % FIPM:
154 MWH, 4.28, 81%



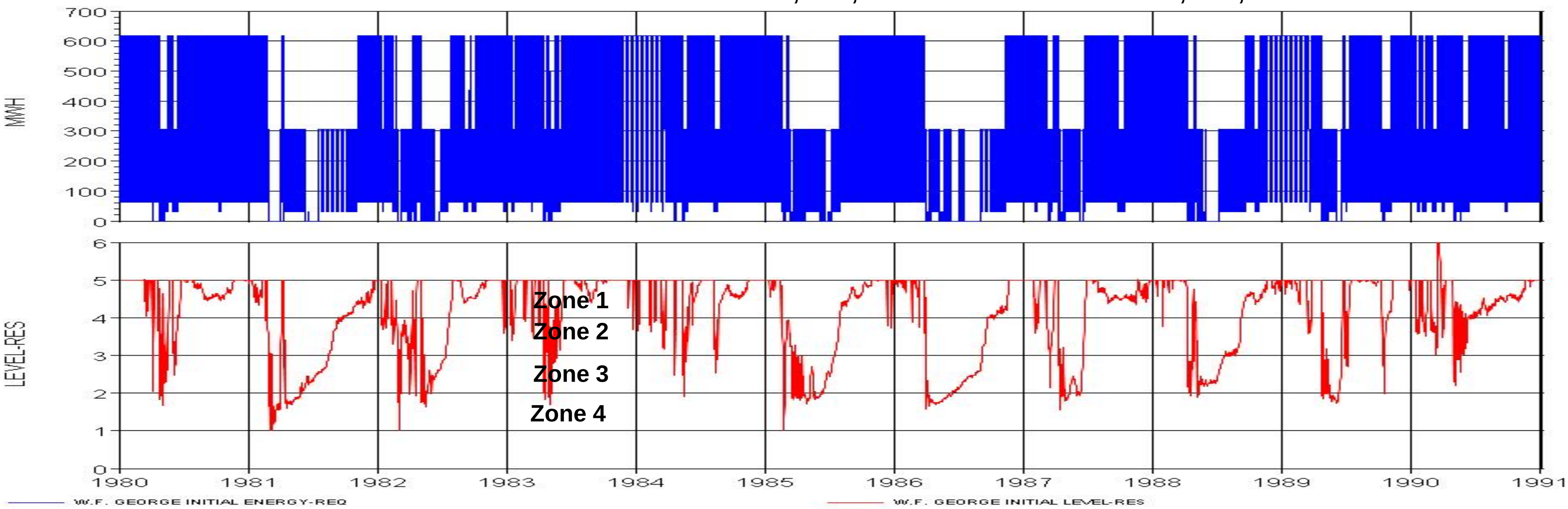
Mean ER, level:
191 MWH, 4.29



USACE INTERIM.DAT/ARC FIPM.DAT – W.F.George

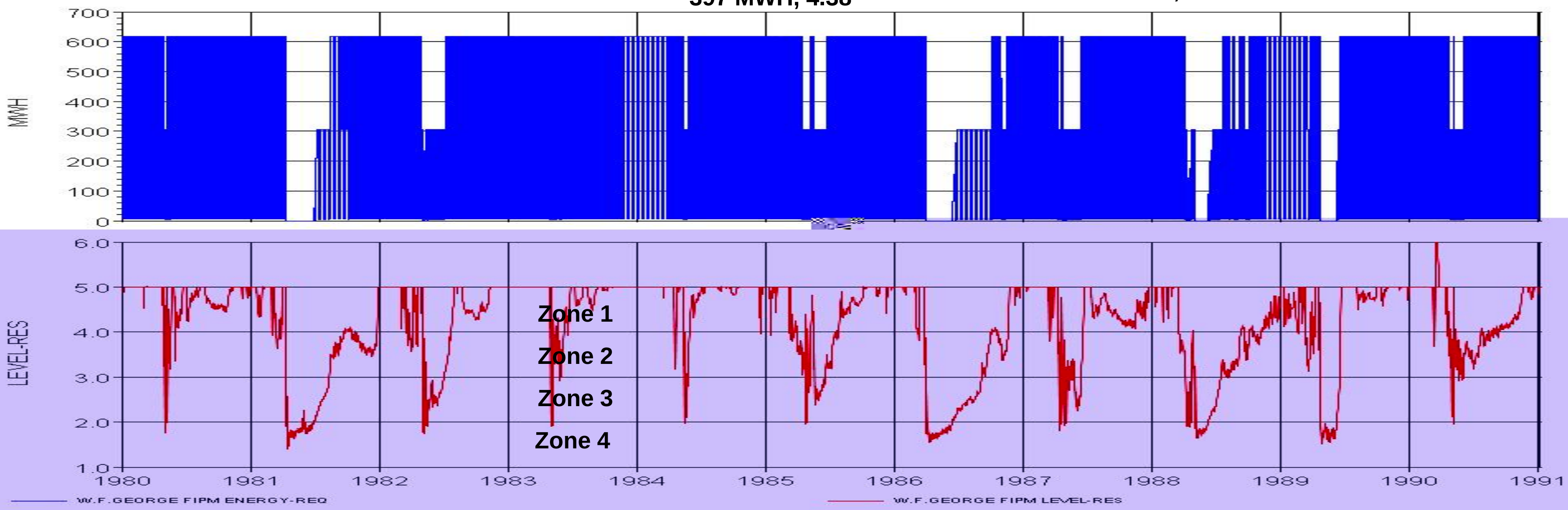
Mean ER, level, % FIPM ER:
382 MWH, 4.39, 96%

System ER, mean level, % FIPM ER:
604 MWH, 4.04, 81%



Mean ER, level:
397 MWH, 4.38

System ER, mean level:
750 MWH, 4.16



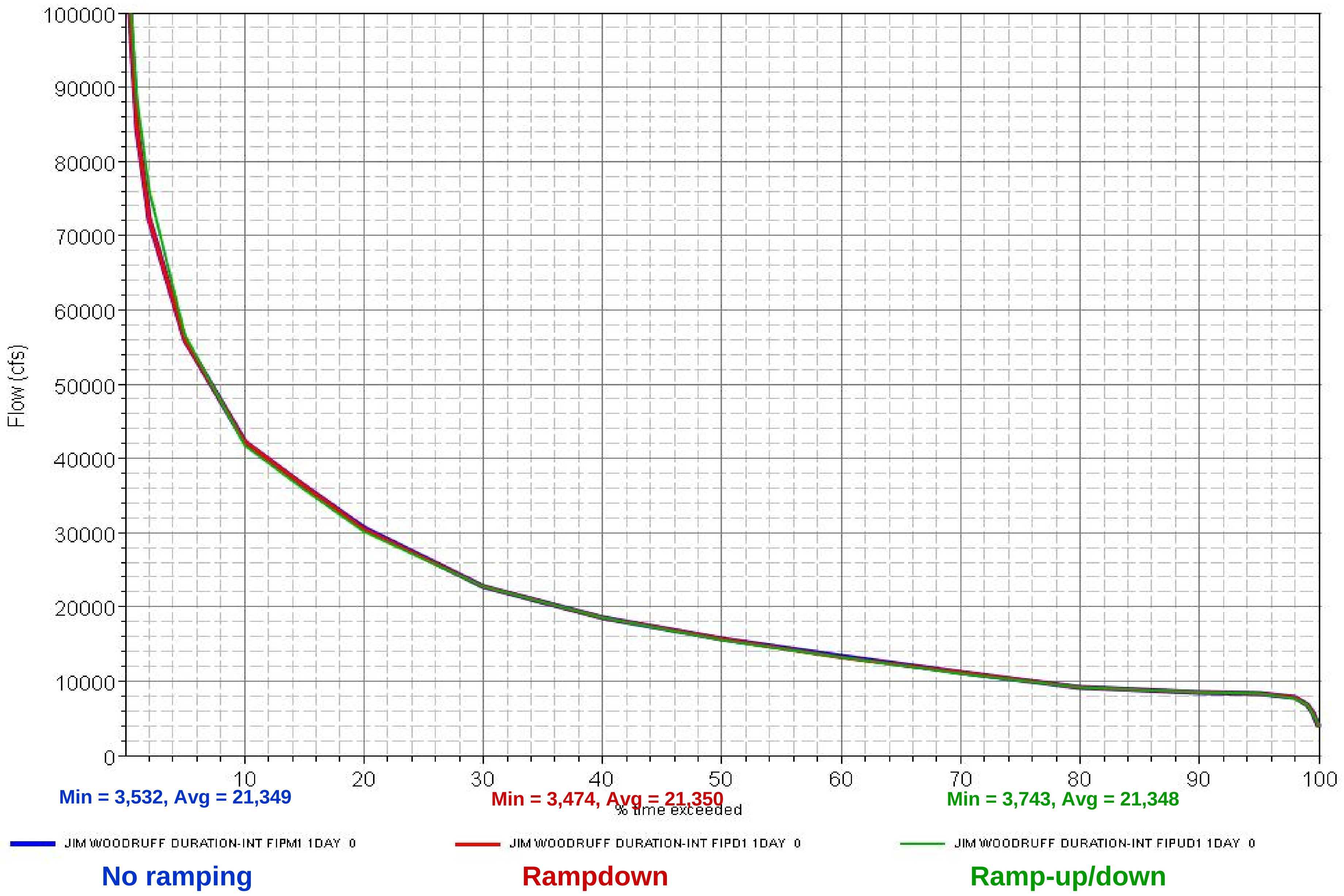
New Lanier turbines/generators

- Penstock capacity: 9,000 -> 12,000 cfs
- Machine capability: 100 mw -> 130 mw(?)
- Power guide curves: 30% PF reduction(?)

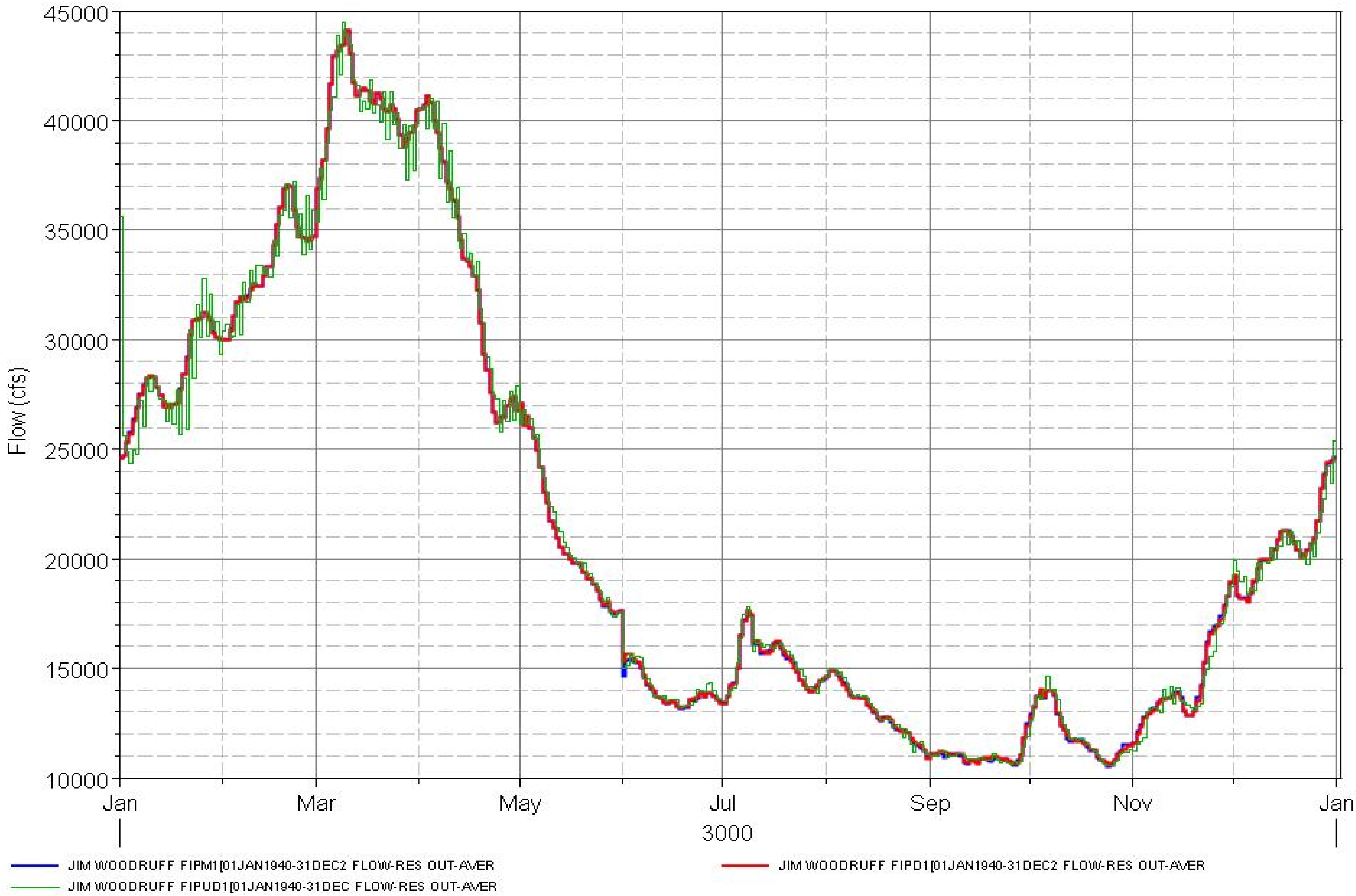
Zone	Hours use, old	Hours use, new(?)
1	3	2.3
2	2	1.5
3	2	1.5
4	0	0

- Increased off-peak, weekend releases to maintain Morgan Falls storage, Atlanta MIF
- Updated P1, P2, PC, PF, PD, PQ, PT, PL, PP, PS, PE records

Ramp-up/ramp-down rate limits

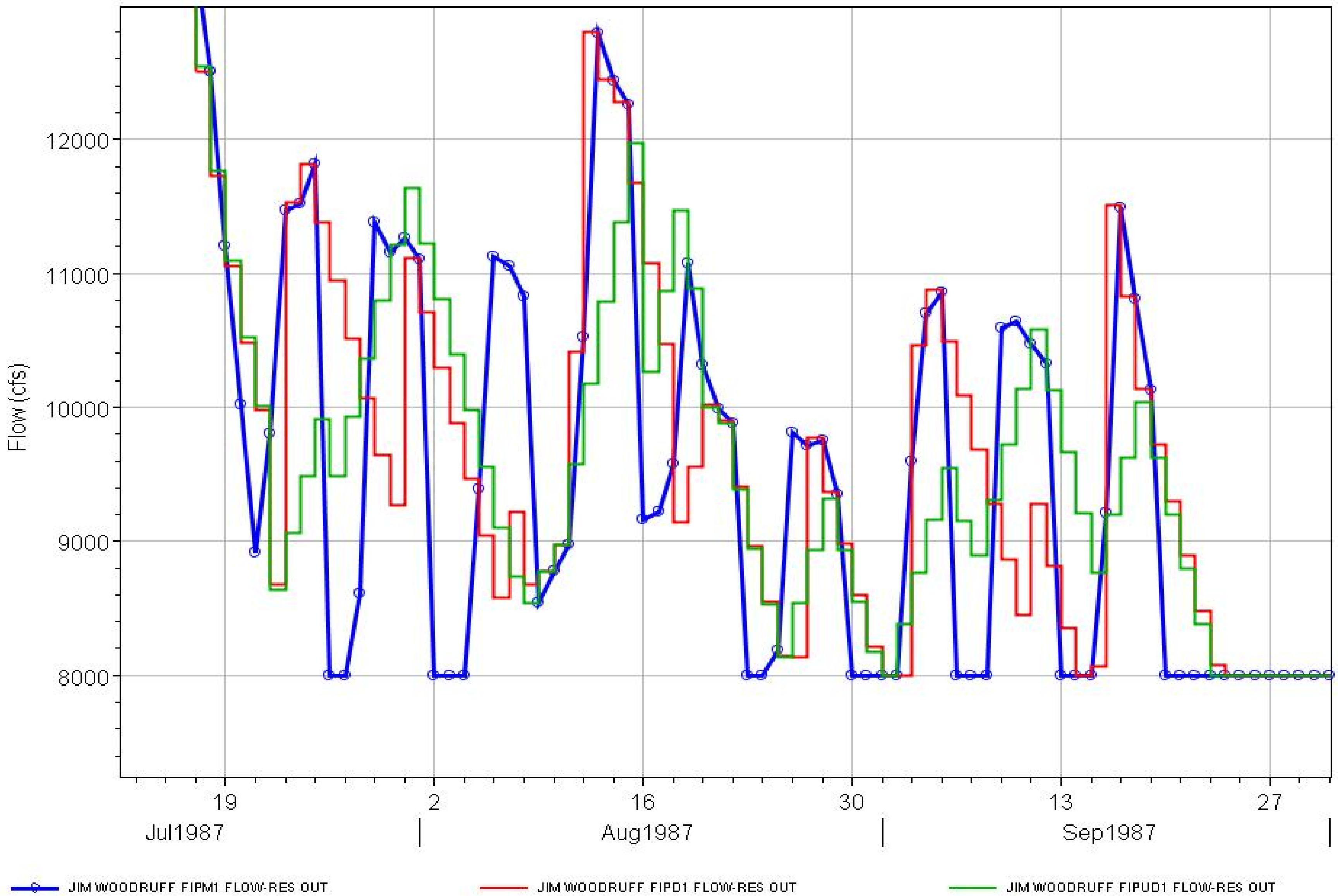


Ramp-up/ramp-down rate limits



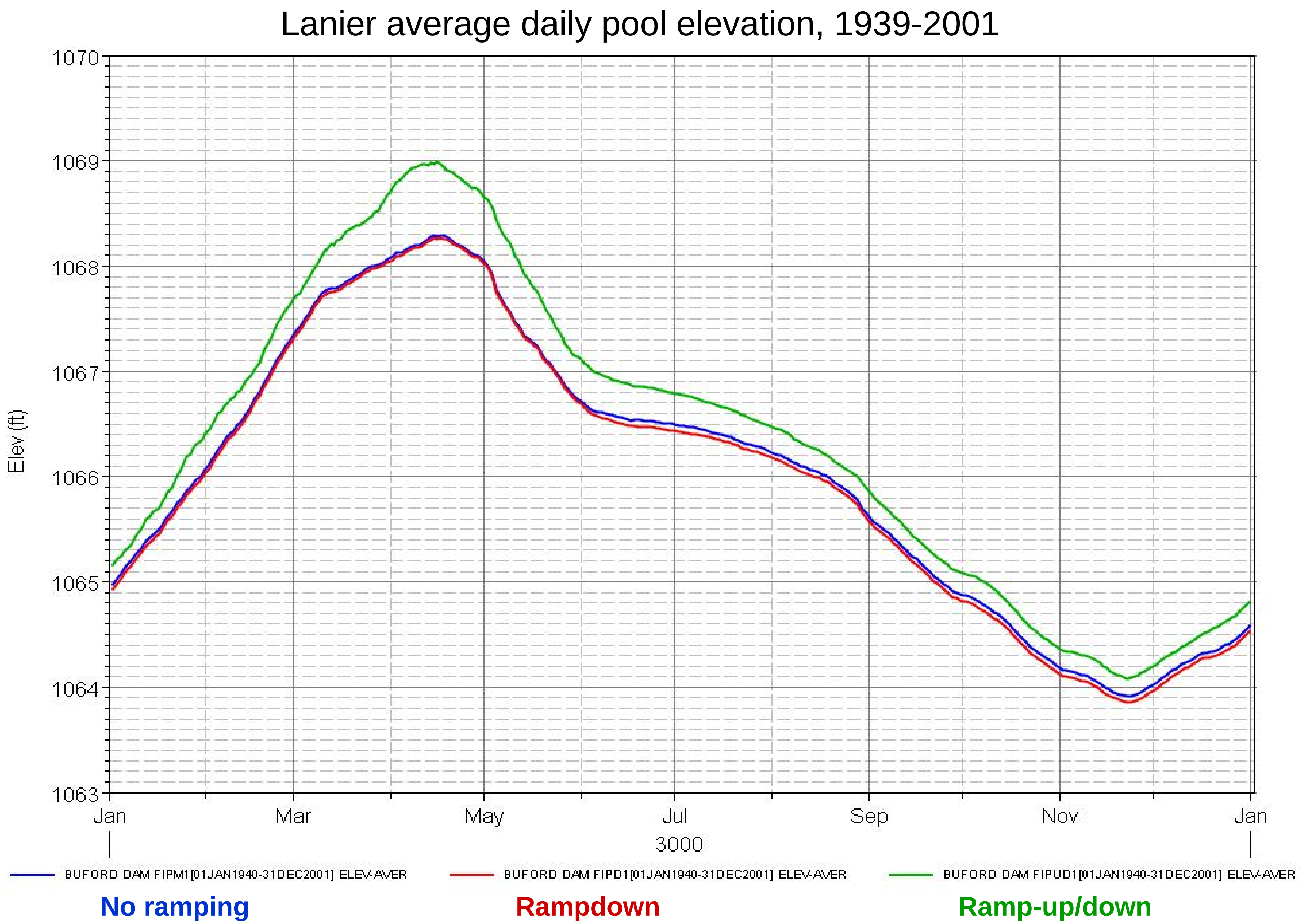
No ramping
Rampdown
Ramp-up/down

Ramp-up/ramp-down rate limits



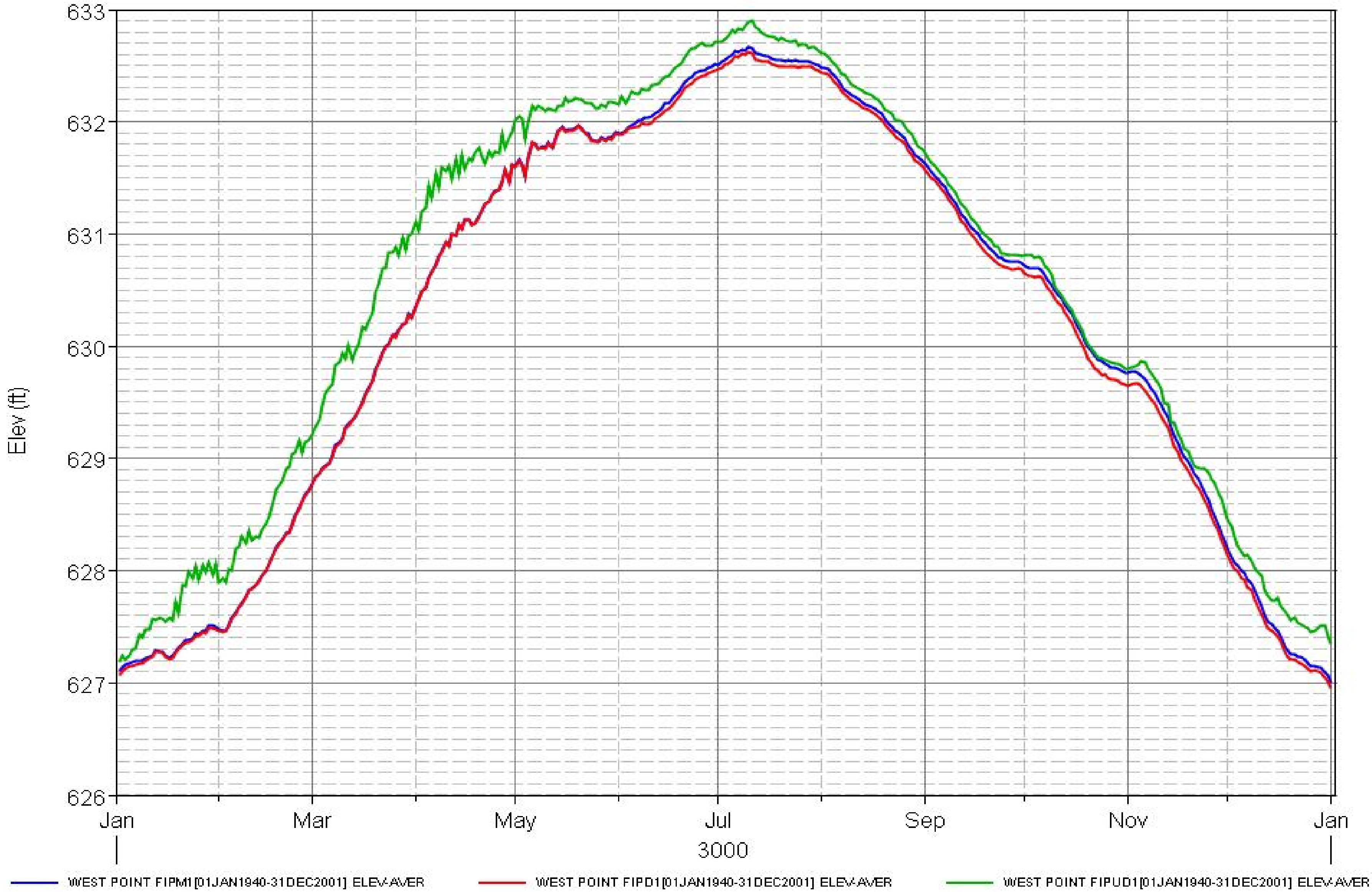
No ramping **Rampdown** **Ramp-up/down**

Ramp-up/ramp-down rate limits



Ramp-up/ramp-down rate limits

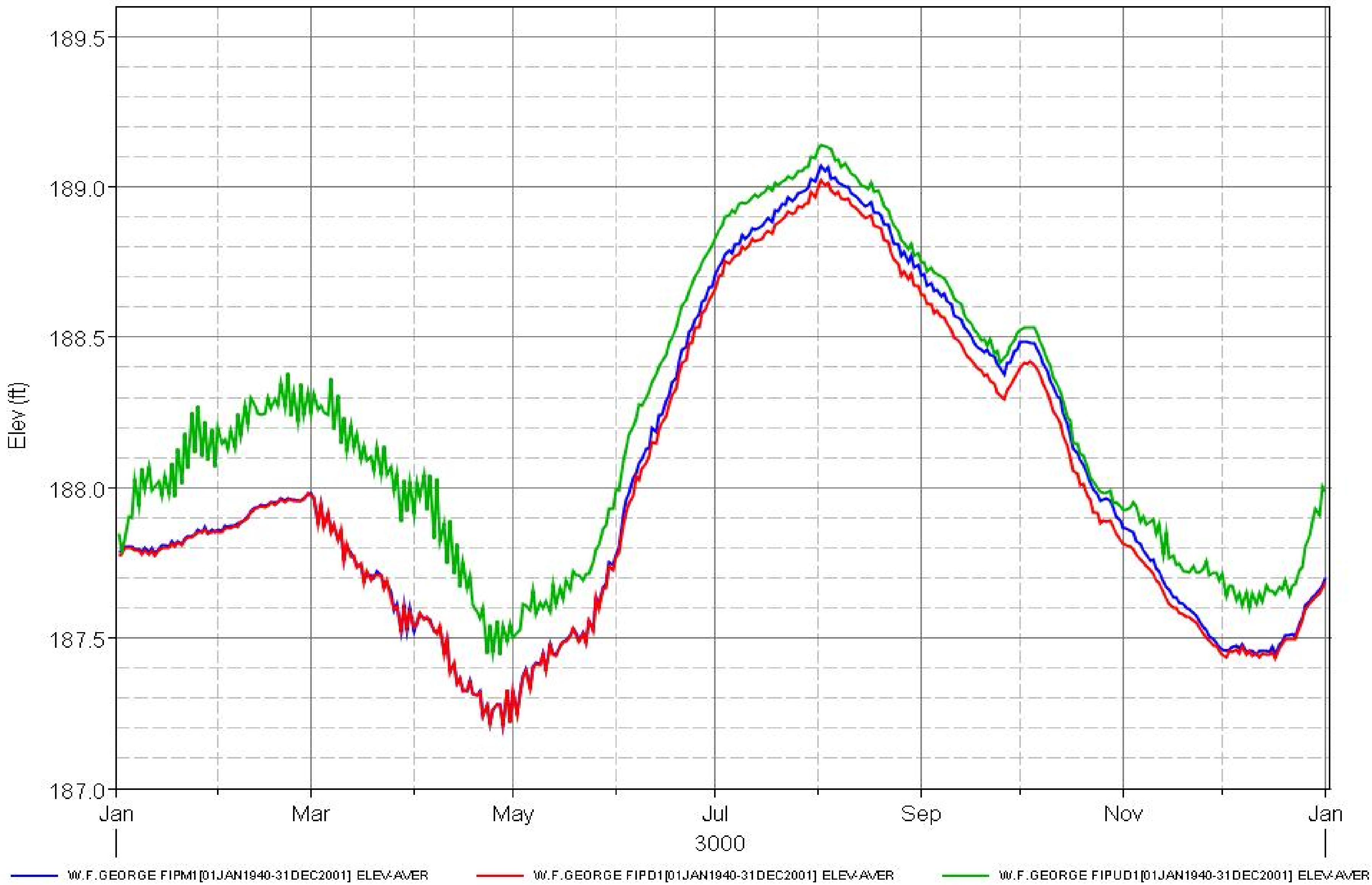
West Point average daily pool elevation, 1939-2001



No ramping **Rampdown** **Ramp-up/down**

Ramp-up/ramp-down rate limits

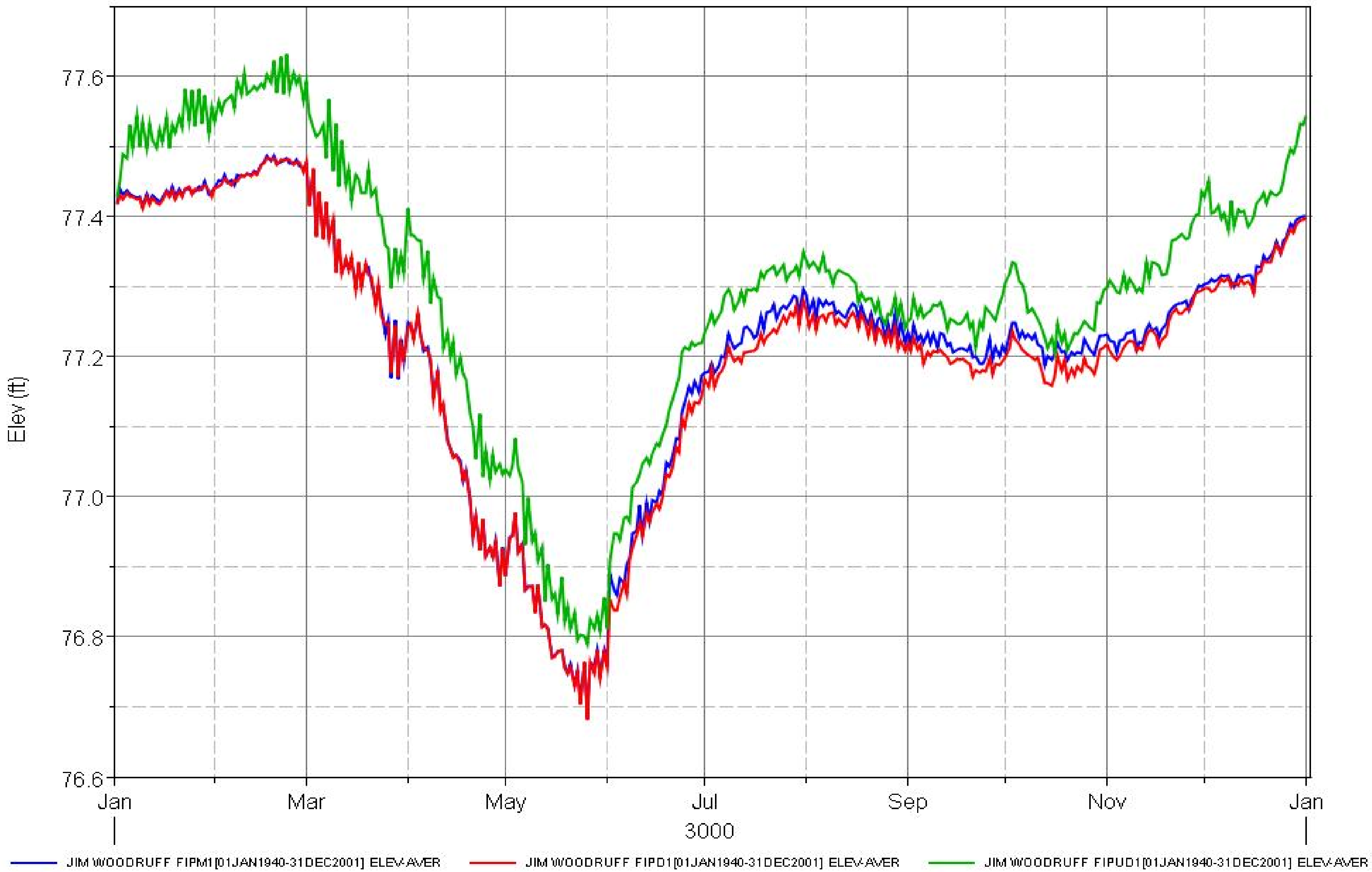
W.F. George average daily pool elevation, 1939-2001



No ramping **Rampdown** **Ramp-up/down**

Ramp-up/ramp-down rate limits

Jim Woodruff average daily pool elevation, 1939-2001



No ramping **Rampdown** **Ramp-up/down**

Woodruff stability considerations

- Woodruff conservation pool, USACE INTERIM.DAT model:
  - BC = 75.0, TC = 77.8, • = 2.8 feet
  - 89,104 af = 44,823 dsf

- Woodruff conservation pool to allow 37,400-cfs spawning releases to bottom of conservation pool:
  - BC = 76.0, TC = 77.5, • = 1.5 feet
  - 51,969 af = 26,201 dsf

- Woodruff minimum conservation pool limits (combining RRM head limitation, 37,400-cfs release
  - BC = 76.0, TC • 77.25, • **= 1.25 feet**
  - **42,259 af = 21,305 dsf**

Seasonal rule curves, guide curves and spawning releases

- Rule curves – induce drawdown and refilling of system storage
  - Fall/winter drawdown
    - Induced drawdown releases > BI
  - Year-round
    - At-site power, MIF requirements: releases > BI
  - Spring refilling
    - Induced refilling releases < BI

- Guide curves – balance system storage among reservoirs to equalize Pr {refill to TC}

Seasonal rule curves, guide curves and spawning releases