Level 4 Drought Operations
Savannah River Basin
Appendices

Photo by D. Nelson, Milkaway Photography used by Permission

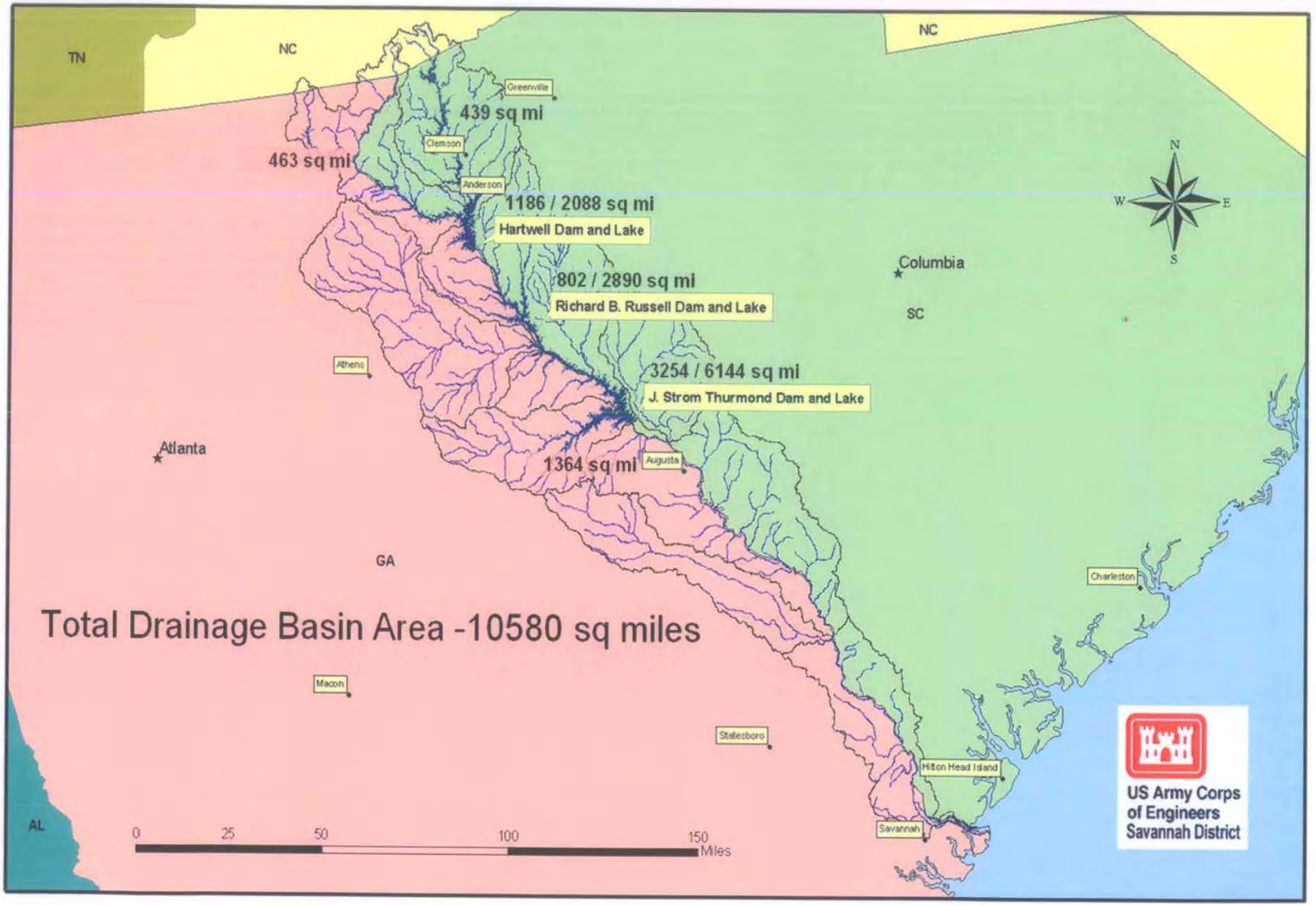
US Army Corps of Engineers
Savannah District

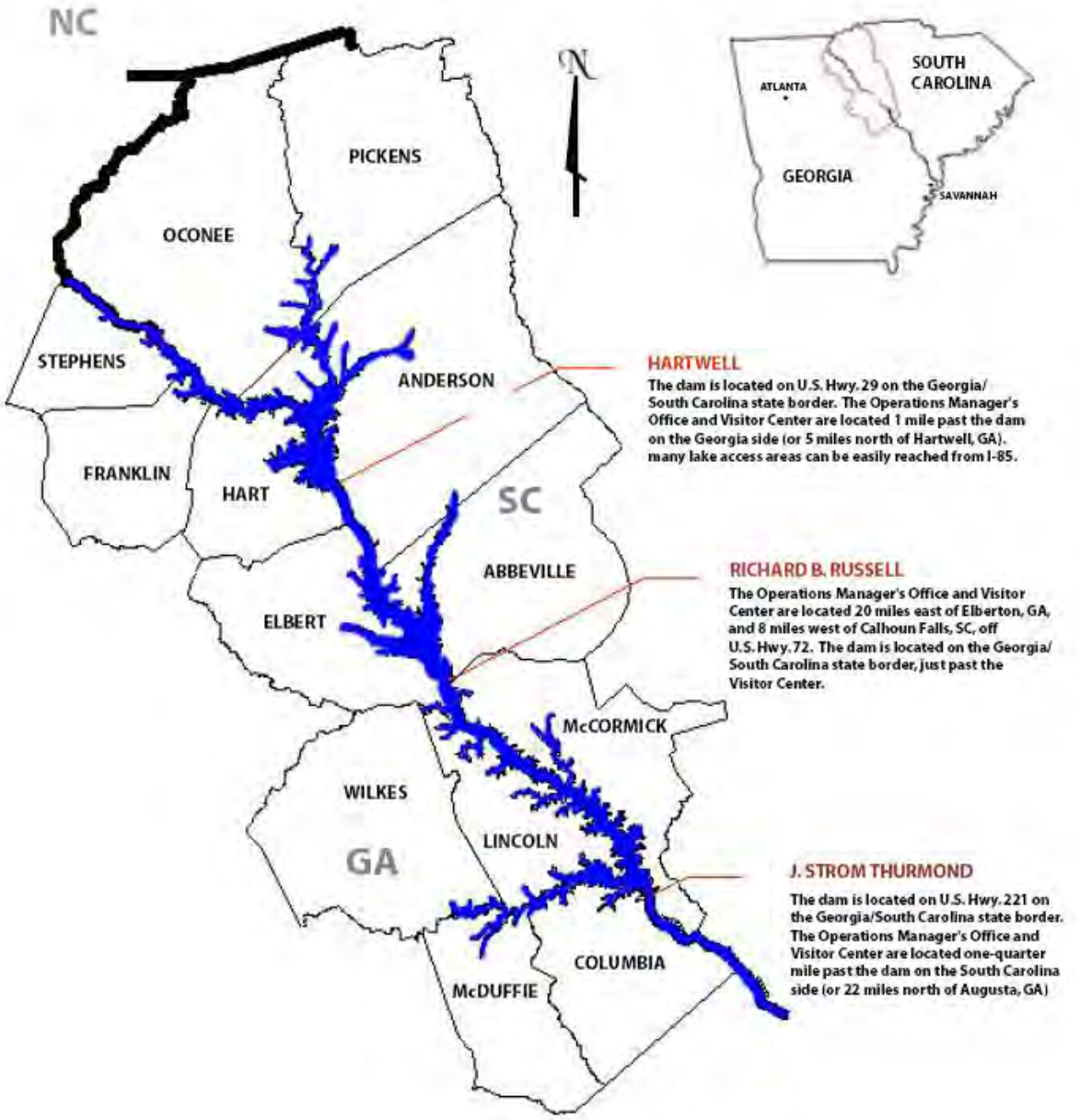
October 2011

LIST OF APPENDICES

APPENDIX A

SAVANNAH RIVER BASIN MAPS


TN
NC
NC
Greenville
439 sq mi
463 sq mi
Clemson
Anderson
1186 / 2088 sq mi
Hartwell Dam and Lake
802 / 2890 sq mi
Richard B. Russell Dam and Lake
3254 / 6144 sq mi
J. Strom Thurmond Dam and Lake
1364 sq mi
Augusta
Athens
Atlanta
Columbia
SC
GA
AL
Charleston
Macon
Statesboro
Hilton Head Island
Savannah
N
W
E
S
0
25
50
100
150
Miles
Total Drainage Basin Area -10580 sq miles
US Army Corps
of Engineers
Savannah District



HARTWELL

The dam is located on U.S. Hwy. 29 on the Georgia/ South Carolina state border. The Operations Manager's Office and Visitor Center are located 1 mile past the dam on the Georgia side (or 5 miles north of Hartwell, GA). many lake access areas can be easily reached from I-85.

RICHARD B. RUSSELL

The Operations Manager's Office and Visitor Center are located 20 miles east of Elberton, GA, and 8 miles west of Calhoun Falls, SC, off U.S. Hwy. 72. The dam is located on the Georgia/ South Carolina state border, just past the Visitor Center.

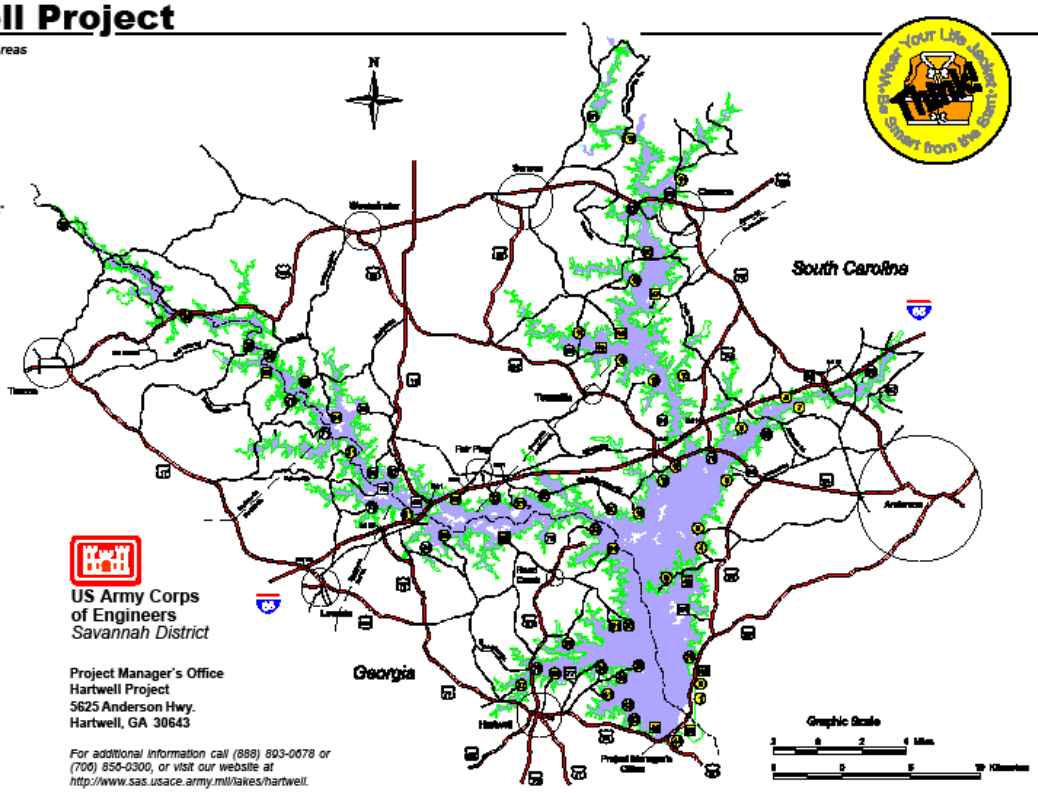
J. STROM THURMOND

The dam is located on U.S. Hwy. 221 on the Georgia/South Carolina state border. The Operations Manager's Office and Visitor Center are located one-quarter mile past the dam on the South Carolina side (or 22 miles north of Augusta, GA)

Hartwell Project

Corps Recreation Areas

1 Hartwell Dam
2 Singing Pines
3 Jarrett*
4 Richland Creek
5 River Forks
6 Green Pond
7 Honea Path*
8 Denver
9 Asbury
10 Eighteen Mile Creek*
11 Twelve Mile
12 Lawrence Bridge
13 Martin Creek
14 Friendship
15 Townville
16 Camp Creek
17 Broyles
18 Apple Island*
19 Double Springs
20 Weldon Island
21 Glenn Ferry
22 Durham*
23 Fair Play
24 Choestoea
25 Mullins Ford
26 Tabor*
27 Walker Creek*
28 Stephens County
29 Spring Branch
30 Jenkins Ferry
31 Poplar Springs
32 Rock Springs
33 Mary Ann Branch
34 Crawfords Ferry
35 Carters Ferry*
36 New Prospect
37 Cleveland*
38 Gum Branch
39 Long Point
40 Duncan Branch*
41 Powderbag Creek*
42 Elrod Ferry
43 Hartwell Group
44 Big Oaks
47 Twin Lakes
53 Georgia River



US Army Corps of Engineers
Savannah District

Project Manager's Office
Hartwell Project
5625 Anderson Hwy.
Hartwell, GA 30643

For additional information call (888) 893-0678 or (706) 856-0300, or visit our website at http://www.sas.usace.army.mil/lakes/hartwell.

Corps Campgrounds

45 Crescent Group Camp
46 Springfield
47 Twin Lakes
48 Oconee Point
49 Coneross
50 Paynes Creek
51 Milltown
52 Watsadler
53 Georgia River

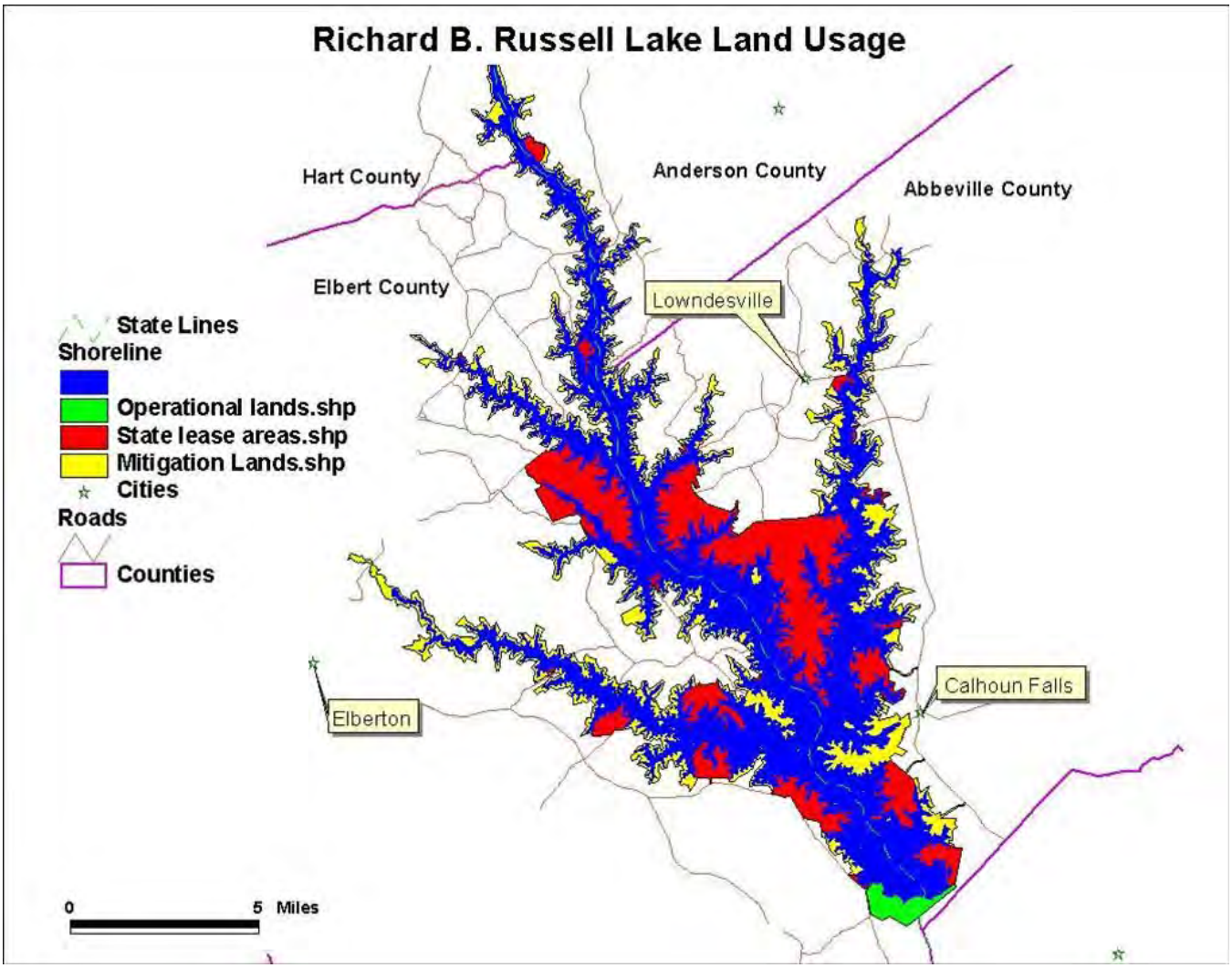
State & Municipal Recreation Areas

54 Sadlers Creek State Park
55 Jack's Landing*
56 White City*
57 Brown Road*
58 Darwin H. Wright
59 Hurricane Creek*
60 Clemson*
61 Holder's*
62 Seneca Creek*
63 Timberlake*
64 Hoyt-Tilley*
65 Cove Inlet*
66 Lake Hartwell State Park
67 Barton's Mill*
68 Port Bass*
69 South Union*
70 Bruce Creek*
71 Holcomb*
72 Tugaloo State Park
73 Franklin County*
74 Rocky Ford*
75 Reed Creek*
76 Bradberry*
77 Hart State Park

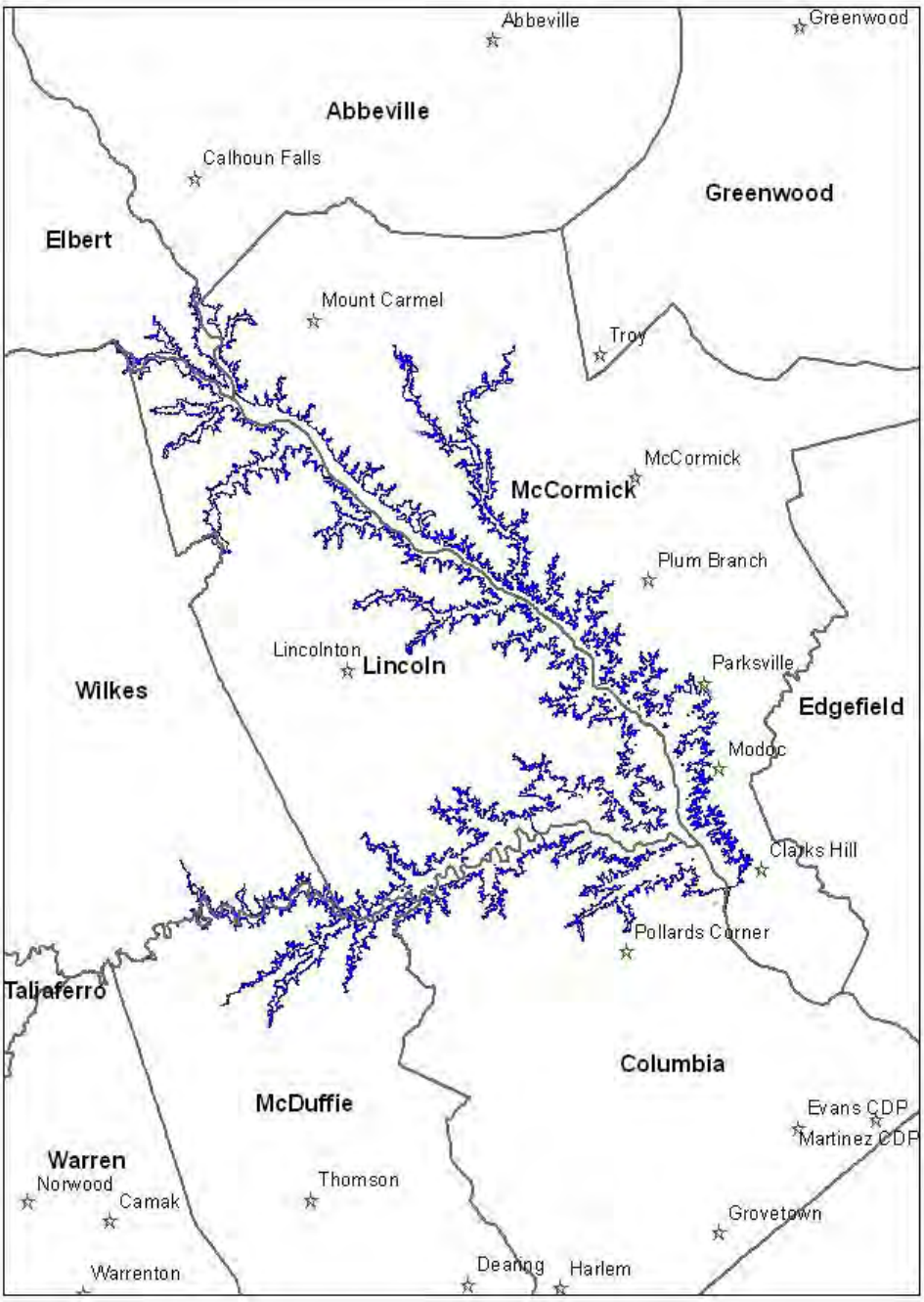
Commercial Marinas

78 Big Water
79 Portman
80 Seneca
81 Harbor Light
82 Hartwell

** Ramp access only*


Richard B. Russell Lake Land Usage
Hart County
Anderson County
Abbeville County
Elbert County
Lowndesville
Calhoun Falls
Elberton
State Lines
Shoreline
Operational lands.shp
State lease areas.shp
Mitigation Lands.shp
Cities
Roads
Counties
0
5 Miles

J. STROM THURMOND RESERVOIR



APPENDIX B

SAVANNAH RIVER SYSTEM

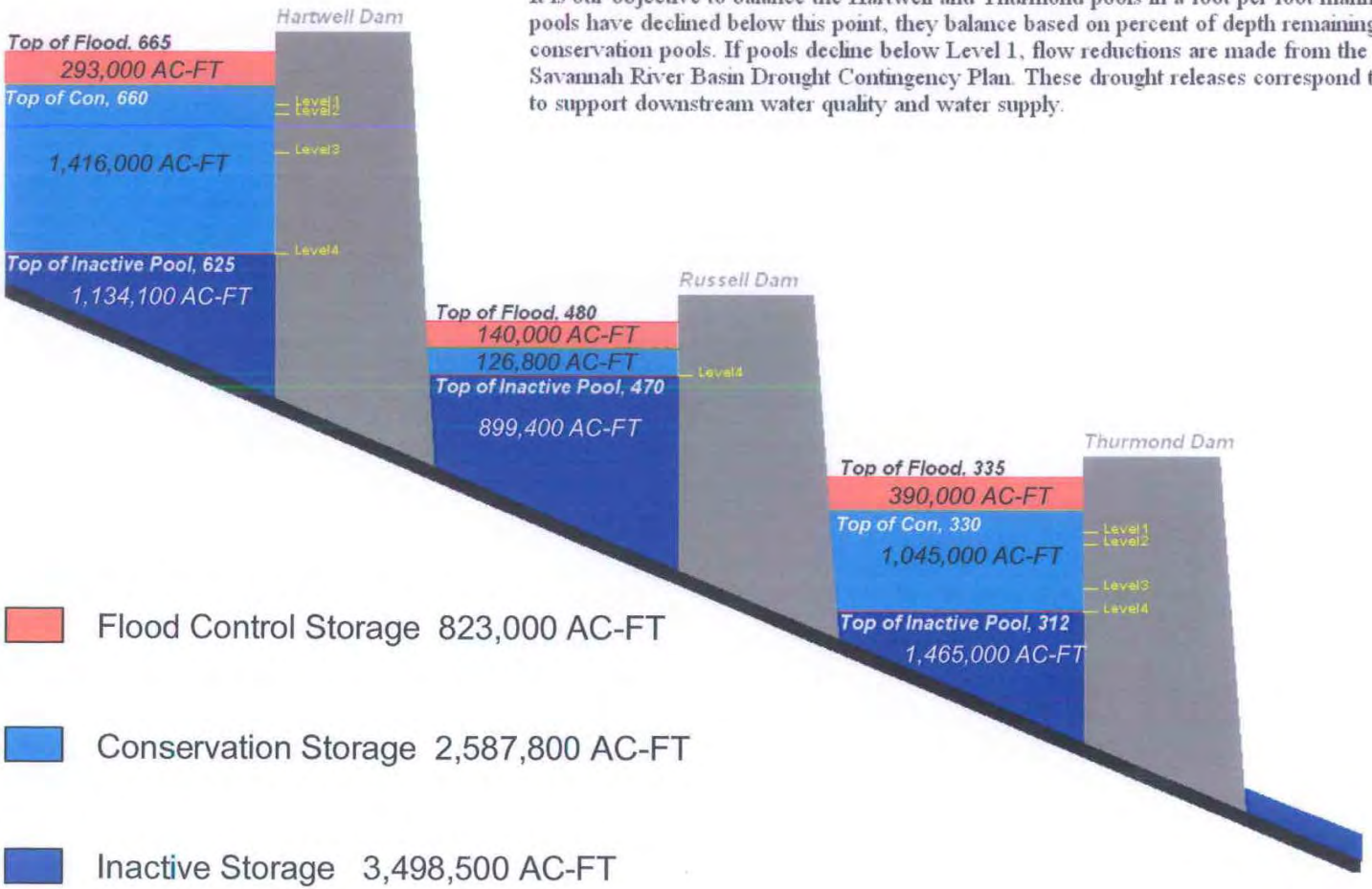
POOL SCHEMATIC

AND

LAKE LEVEL GRAPHS

Savannah River System
Pool Schematic

It is our objective to balance the Hartwell and Thurmond pools in a foot per foot manner for the top 15 feet. Once the pools have declined below this point, they balance based on percent of depth remaining in their respective conservation pools. If pools decline below Level 1, flow reductions are made from the system in accordance to the Savannah River Basin Drought Contingency Plan. These drought releases correspond to the minimum flows needed to support downstream water quality and water supply.



Flood Control Storage 823,000 AC-FT

Conservation Storage 2,587,800 AC-FT

Inactive Storage 3,498,500 AC-FT

APPENDIX C

2008 AGENCY PROPOSAL

Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts

Georgia Department of Natural Resources, Environmental Protection Division

(Georgia EPD)

South Carolina Department of Health and Environmental Control

(SCDHEC)

South Carolina Department of Natural Resources

(SCDNR)

July 2008

Executive Summary

As the ongoing drought in the southeastern U.S. approaches its third summer, the Savannah River reservoir system operated by the Army Corps of Engineers (hereafter referred to as the Savannah System) is experiencing extreme pressure and difficulties. As of July 23, 2008, the system has only 46% of its conservation storage remaining. Hartwell and Thurmond, the two large storage reservoirs, are approximately 12 feet below normal pool levels. Hartwell has less than 57% of its conservation storage left, and Thurmond has only 28% of its conservation storage remaining.

The recharge season of the year has long gone, and the status of the system is of particular concern to many parties in both Georgia and South Carolina depending on the resources provided by the storage in these reservoirs. Low inflows to the system last year and early this year raised the prospect that the system storage may be exhausted in the near future and a consequent transition to Level 4 operations (only releasing inflow) may be on the horizon.

Based on the Information Paper provided by the Army Corps of Engineers (Corps) and information compiled by other cooperating institutions, Georgia EPD, in coordination with SCDHEC and SCDNR, conducted a thorough analysis of potential operations of the system under a variety of hydrologic conditions. Georgia EPD, SCDHEC, and SCDNR propose that the current operation (i.e. a Thurmond release of 3,600 cfs) be revised to maintaining a 3,600 cfs release from Thurmond Dam in the warmer months of March through September and reducing the release to 3,100 cfs in the cooler months of October to February of next year.

The analysis conducted by Georgia EPD, in coordination with SCDHEC and SCDNR, indicated that such operations would be able to stabilize the system and substantially reduce the speed of decline in system storage. Even under a very pessimistic assumption of inflow (10% worse than the lowest historic inflow) for the next three consecutive years, the proposed operations would be able to prevent the system conservation storage from being depleted. System storage would only approach depletion toward the later part of 2011, with the assumption that worse-than-the-worst hydrology will persist through the years (a highly improbable event).

Our analyses indicate that water users along the river will not be impacted as a result of this revised operation. Also, modeling and field observations indicated that it is unlikely that water quality will be of a concern. Further modeling can be conducted if stakeholders raise additional concerns. In addition, water quality monitoring stations will need to be enhanced at strategic river locations to ensure that there is sufficient real time data available to evaluate and appropriately respond to during modified dam operations.

With respect to intake limiting factors, some of the intakes at the lower reaches may experience little margin in their access to water and thus their functionality. If the lowest incremental flow (recorded in 2007) were to take place again this year, some intakes may not function well in the short period of a few days. However, there are actions that can be taken to mitigate the impact, such as drought-proof engineering measures that will either deepen the bottom elevation at the intake or elevate the surface elevation, or adaptive management measures whereby the facility monitors the river elevation to make sure that sufficient flow takes place when incremental flow is not sufficient. Vulnerable facilities all across the basin will be part of a process that will ensure that proper emergency management measures are incorporated into local planning during this drought emergency.

Background Information

The Savannah River Basin has been experiencing a drought since early 2006. Rainfall and resulting stream flow have been particularly low, causing the reservoirs to drop faster than during previous droughts. If low inflows persist or deteriorate, the current drought could become the new drought-of-record for the basin.

The Corps manages its three impoundments on the Savannah River as a system and uses a Water Control Manual to describe how it will operate those projects. The Drought Contingency Plan is a component of that Manual and was developed (1) to address the effects of the Corps' operation on those impoundments and the downstream portion of the river, and (2) to assist the States of Georgia and South Carolina in drought contingency planning in their water management responsibilities for the Savannah River Basin.

The Corps' 1989 Drought Contingency Plan (DCP) and a 2006 Environmental Assessment (EA) describe activities that would be conducted during four stages of a continuing drought. Those four stages correspond to different lake levels. When the reservoirs reach the Level 1 trigger elevation, the Corps issues a public safety advisory concerning recreational use of the reservoirs. The Corps also reduces discharges from the reservoirs when Levels 1-3 are reached. When Level 4 is reached, the conservation pools are empty. If drought conditions persist after Level 4 is reached, discharges are further reduced to the point where the outflow from the lakes equals the net inflow.

The actions the Corps would take surrounding the Level 4 trigger were never evaluated in detail when the plan was originally developed or during the 2006 Update. The Reservoir System Simulation modeling conducted to analyze the effects of the various operational scenarios during development of the 1989 DCP and its 2006 EA for the DCP Update always indicated that the lakes would not reach the bottom of conservation pool. This modeling was conducted using inflows that were the drought of record at that time. Sensitivity analyses revealed that the drought would need to extend three additional years to reach Level 4. Therefore, detailed consideration was never given for the best way to operate once that trigger was reached.

It should be noted that when a new drought of record takes place, the Corps' operational objective should always be to avoid ever reaching the bottom of the conservation pool. This requires a constant evaluation of the current operations and the update of the drought of record. If the current drought becomes the drought of record, then additional measures not included in the previous Manual or Drought Contingency Plan should be considered and evaluated to achieve this objective.

Status of System and Issue of Concern

As of 8:00 am July 23, 2008, the federal reservoirs on the Savannah River have 1.19 million acre-feet of conservation storage remaining. This is equivalent to 46% of the system conservation storage. Hartwell has 57% of its conservation storage remaining, while Thurmond has only 28% of its conservation storage available.

The recharge period in 2008 is over at this time, and both Hartwell and Thurmond are roughly 12 feet below their respective normal pool levels. Through the summer months, the evaportranspiration rate will increase, making it all but impossible for the reservoirs to meaningfully gain any storage during this time. This holds true regardless of the prospect of precipitation in the summer, even with the overly optimistic assumption that normal rainfall takes place.

Recent updates from climatologists and meteorologists suggest that it is likely that the current drought will extend into this summer and beyond. If this holds true, it is expected that inflow to the reservoir system will remain low or at least below normal, making it a likely scenario that the Corps will need to use storage to augment releases prescribed by the operation Manual and the Drought Contingency Plan.

If the drought persists or deteriorates, it is not inconceivable that the limited conservation storage will be exhausted, or at least be depleted to an intolerable extent. It is extremely important that all measures be evaluated to prevent the depletion of the Savannah System conservation storage. The following sections of this report document contemplated ways to achieve this.

Principles of Operations

We believe the principles of operating the Savannah System are the following: (1) To the extent possible, the Corps should try all it can to avoid depleting the conservation storage. (2) In order to achieve that, the Corps should take early measures to avoid ever reaching the bottom of the conservation pool. (3) The Corps should more explicitly identify the elevation and flow thresholds below which serious impacts take place at facilities across the basin. (4) If hydrologic conditions are such that an early intervention is unavoidable, then the Corps should identify the flow level below 3,600 cfs that bears the least impact and reduce its release from Thurmond Dam to that level. (5) The water users should identify ways (e.g. local engineering measures) of avoiding or mitigating impacts of such flow reduction and communicate such measures as well as the costs of such measures to the Corps and the States.

Proposed Hydrologic Conditions for Evaluation

On an annual basis, the total amount of inflow to the Savannah System (defined as the Savannah River reservoir system operated by the Army Corps of Engineers) was lowest in 1988, averaging only 3,286 cfs. The second lowest year was 2007, with an average inflow of 3,302 cfs. Based on a long-term average annual inflow of 7,852 cfs, the amounts of inflow in these two years are 42% of normal.

It is thus suggested that the hydrologic conditions of these two years be used to evaluate adverse conditions the system may experience in the rest of 2008 and the next two years. We believe it is a conservative assumption that the on-going drought (which is very close to the drought of record), after impacting for more than two years now, would repeat itself in the next three years. This basically means that after a year of 3,302 cfs inflow, inflow at this level would repeat again and again in each of the next three years.

We also suggest that variations of the 1988 and 2007 hydrology (e.g. 10% reduction in inflow) be used to evaluate potential operations of the Savannah System. We believe it is a very conservative assumption that another round of drought of record with a magnitude of 10% reduction in inflow

will repeat itself in 2008, 2009, 2010, and 2011. This gives us the possible but very unlikely hydrologic scenario that after a year of 3,302 cfs inflow, we would have another two to three years in a row with inflow lower than 3,000 cfs (38% of normal).

Baseline Operations under Proposed Hydrologic Conditions

The Corps' current operation calls for a release of 3,600 cfs from Thurmond Dam. This operation's impact on the reservoirs can be assessed with the Corps' spreadsheet tool. Using this tool and the assumed hydrologic conditions, we were able to show how system conservation storage would change as a result of the baseline operation.

Fig. 1 shows the impact of the baseline operation on system conservation storage under recorded 2007 inflow and a variation of this inflow series. Under 2007 hydrology, system storage will continue to decline to dangerously low levels toward the end of 2008, with only 18% of conservation storage remaining in Hartwell, Russell, and Thurmond. System conservation storage will recover somewhat in early 2009, but start declining again in April 2009 and reach 15% late 2009.

Under the hydrologic scenario with a 10% reduction in inflow, the system will fare even worse. There will be about 16% of system conservation storage left by the end of 2008, and only 3% remaining by the end of 2009. The conservation pool would be virtually empty at this point. The conservation pool will be completely exhausted by November 2010.

Fig. 2 shows the impact of the baseline operation on system conservation storage under another record dry year with a different precipitation pattern, year 1988. Under this hydrology, system conservation storage will see a less dramatic decline in the summer and fall seasons, but also with a less pronounced recovery in the following winter and spring. Overall, there will be a declining trend.

Under the reduced 1988 inflow scenario, system storage will reach 10% by the end of 2009, and be completely exhausted by October 2010.

In order to gauge the potential of devastating consequences, a probability of status analysis was performed for the Savannah River basin. It is assumed that 2007 hydrology is to repeat itself in 2008, and the resulting system storage by December 31, 2008 would be around 16% (see Fig. 1). With this as the starting condition for 2009, and hydrologic conditions from 1954 through 2007 applied to the Savannah system, there is a substantial probability (see Fig. 17) that the system will either be completely empty by the summer of 2009 (2% probability), or that the system will be further depleted toward the end of 2009 (6% probability). The probability of such catastrophe may be small, but it is substantial and its consequences severe.

It is apparent that if the current drought persists at its current intensity or if it intensifies, the baseline operation is not enough to stabilize conservation storage, let alone refilling the system. For the benefit of all stakeholders in the basin, more needs to be done to stop the loss of conservation storage in the middle of this drought.

Critical Flow Requirements

Prior work done by Georgia and South Carolina resource agencies and the federal government provided critical elevations for most withdrawing facilities along the main stem of the Savannah River downstream of Thurmond Dam. This information is provided in Table 1.

Based on rating curves provided by Georgia EPD's Savannah River water quality model, we were able to calculate flow rates that correspond to these minimum elevations. The flow rates are also provided in Table 1.

From this exercise, it is clear to us that the likely controlling flow rates are those at Savannah Electric-Plant McIntosh and Georgia Pacific. The minimum desired flow rate at the intake of Savannah Electric-Plant McIntosh is calculated to be 3,500 cfs. The minimum desired flow at the intake of Georgia Pacific is calculated to be 3,300 cfs. However, since surface elevation in the river at these two facilities is under tidal influence, which may nullify the effects of low stream flow in the river, this tidal influence may help ease the concern that potential reduction in Thurmond release would impact the facilities' intake.

Since flows desired at the locations of the other facilities are much lower than what is needed to sustain water access at these two facilities, we believe these flow rates should serve as the basis for the computation of any potential relief of flow requirement at Thurmond Dam.

Another factor to consider is that there exists substantial amount of incremental flow between Thurmond Dam and the intakes of either Savannah Electric-Plant McIntosh or Georgia Pacific. A flow at the locations of these facilities is the result of Thurmond release supplemented by incremental flow between Thurmond and the concerned location.

Recorded Incremental Flow

If the Corps considers potential relief from the 3,600 cfs minimum release requirement from Thurmond, then it is critically important to determine the amount of incremental flow between Thurmond and the locations of the controlling facilities. Since the closest USGS gauge to the two controlling facilities, Savannah Electric-Plant McIntosh and Georgia Pacific, is Savannah River near Clyo, Georgia (02198500), we need to use the incremental flow between Thurmond and the Clyo gauge to estimate the amount of incremental flow. Also, since the Clyo gauge is upstream of these two facilities, the entire amount of incremental between Thurmond Dam and the Clyo gauge can be applied to both facilities.

Using release data from Thurmond (Corps) and gauged stream flow data at the Clyo gauge (USGS), we were able to derive incremental flow between these two locations. For the purpose of smoothing out the impact of routing and travel time, we applied a 7-day moving average for both variables.

As shown in Fig. 3, the magnitude of incremental flow between Thurmond and the Clyo gauge stayed above 500 cfs for most of 2007, with the exception of a few days in November 2007, when it dropped to around 300 cfs. For the previous drought of record, year 1988, the incremental flow between these two locations remained higher than 800 cfs (See Fig. 4).

As the U.S. Drought Monitor (Figs. 5 and 6) indicate that the lower Savannah River Basin is in better shape compared to the worst time in last year, when the incremental flow was the lowest in November 2007, and the fact that the coastal area may benefit from ocean-originated precipitation in the summer and fall, it is reasonable to assume that the incremental flow between Thurmond and Clyo this year will not be at a level worse than in 2007. In other words, it is not unreasonable for us to expect at least 300 cfs to 500 cfs of incremental flow between Thurmond and the Clyo gauge.

Proposed Relief from Thurmond Minimum Flow Requirement

We use the most severe hydrologic conditions suggested earlier in this document to evaluate the contemplated alternative operations of the Savannah System. These conditions are recorded 2007 inflow with a 10% reduction and recorded 1988 inflow with a 10% reduction. A repetition of such conditions, after two years of record-breaking drought, for the next three or four years, in our opinion, provides enough of a challenge to the entire system. Table 2 provides a summary of all the simulations.

Based on the estimated minimum incremental flow of 300 cfs to 500 cfs, we can use a Thurmond release of 3,300 cfs and 3,100 cfs to test the impact to the reservoir system and the downstream river. It is reasonable to assume that at these levels of Thurmond release, the needs of the other stakeholders are met (Table 1).

We first tested a flat release from Thurmond Dam of 3,300 cfs and 3,100 cfs with both hydrologic conditions. Table 2 provides a summary of the hydrologic conditions and alternative operations in the tested scenarios. The resulting reservoir conservation storage change is shown in Figs. 7 and 8.

Under the recorded 2007 hydrology (with a 10% reduction in inflow), a release of 3,300 cfs from Thurmond Dam will not be enough to stabilize the reservoir system. There will be a sharp decline of system conservation storage, resulting in a low system storage at 20% toward the end of 2008. Storage will recover somewhat during the winter and spring period of 2009, but will start to decline again and reach a new low (16%) toward the end of 2009. If hydrologic conditions do not improve

dramatically, this downward trend will continue, and the low system storage will keep declining year after year (Fig. 7).

If release at Thurmond Dam is reduced to 3,100 cfs, however, the trend of decline will be stopped. The system storage will still go up and down seasonally, but the declining trend under the 3,300 cfs release will cease to exist.

Under the recorded 1988 hydrology (with a 10% reduction in inflow), the seasonal decline in the summer and fall will be less dramatic than under the 2007 inflow, however, there will be less of a recovery in the following rainy season (Fig. 8). Under a 3,300 cfs Thurmond release, system storage will reach 34% by the end of 2008 and around 24% toward the end of 2009. This moderate reduction in Thurmond release is far from enough to stop the sharp declining trend in system storage.

If release at Thurmond Dam is at 3,100 cfs level, the overall declining trend will still exist. However, the rate of decline of system conservation storage will be much more moderate compared to the rate of decline under a release of 3,600 cfs (baseline) or 3,300 cfs (Fig. 8).

We understand that a full-scale deviation from the minimum release of 3,600 cfs may require the Corps to go through the NEPA process and to conduct an Environmental Impact Study, which may take years to complete and cause the loss of opportunity to slow the decline of system storage. We also understand that a seasonal deviation (e.g. a reduced release from Thurmond Dam in the cooler seasons) may be easier to achieve, since an Environmental Assessment may suffice in this case.

Thus, we tested an operation scenario where release from Thurmond will be kept at 3,600 cfs for the months of March through September and reduced to 3,100 cfs for the cooler seasons (October through February). The resulting conservation storage percentage (under both 2007 and 1988 inflow with a 10% reduction) is shown in Fig. 9. It can be seen that system conservation storage will remain available at least throughout the next three years. With such adverse hydrologic conditions, system storage will continue to decline, but at a comparatively slow rate.

Under this operation scheme, even if record-breaking drought conditions continue during the next three years, there will be enough conservation storage to support the revised Thurmond release, and the Corps will have enough time to make further revision of its operations in response to persistent or deteriorating conditions.

We make the recommendation that the Corps adopt this operation scheme.

Impacts to Lake and River Water Users

The suggested operation will not be any different from the current baseline operation in the months between March and September, and should not have any impact on water supply intakes throughout the basin during this time period.

In the cooler seasons when Thurmond release is reduced to 3,100 cfs, the most likely impact, based on information in Table 1 and earlier analysis, will be felt by facilities downstream of Thurmond Dam. These facilities include Savannah Electric-Plant McIntosh and Georgia Pacific. Because the proposed operation will not deplete system conservation storage, water users whose intakes are located in the pools of Hartwell, Russell, and Thurmond will not be affected.

Flow at the locations of Georgia Pacific can be determined by Thurmond release with the addition of incremental flow between Thurmond and the Georgia Pacific intake, which is estimated to be around 500 cfs at the driest times, except for a few days, when it may be as low as 300 cfs. This will result in the lower flow at the Georgia Pacific intake to be at 3,600 cfs generally, and at 3,400 cfs at the lowest level. Given that the facility intake will function at flows higher than 3,300 cfs, it is expected that the proposed revision in operation will not have any impact to this facility.

Flow at the intake of Savannah Electric-Plant McIntosh can also be determined similarly. The proposed operation may result in an at-site flow of 3,400 cfs to 3,600 cfs at the intake of Plant McIntosh. Table 1 shows that the intake at Plant McIntosh functions at the minimum flow of 3,500 cfs. So, if the lowest incremental flow (recorded in 2007) were to take place again this year, the intake at this facility may not function well in the short period of a few days when the at-site flow is as low as 3,400 cfs. However, since water surface elevation at this facility's intake is under tidal influence, any impact resulting from reduced Thurmond release may be nullified.

Also, there are measures that can be taken to mitigate the impact. First, drought-proof engineering measures can be taken to either deepen the bottom elevation at the intake or to elevate the water surface elevation. The Corps may be able to help such measures through federal emergency programs. In fact, we encourage all water users in the basin to consider local measures that can make water supply more secure.

Second, adaptive management can be put in place to monitor the elevation at this facility to make sure that sufficient flow takes place when incremental flow is not enough.

There may also be concern from water users along the Augusta Canal. Diversions into the Augusta Canal is managed by the City of Augusta to maintain a minimum of 1500 cfs (1500 cfs May through January and 1800 cfs otherwise) through the shoals. Three electronically controllable gates, operated by the City of Augusta, allow for instantaneous changes of flow to the canal should a management target be approached.

Based on current permit information on the City of Augusta intake, the City is allowed to withdraw no more than 45 MGD (about 70 cfs). The City has four turbines to operate for water supply operations. These turbines are driven by water in the Canal. Then in turn they drive pumps to pump water for water supply purpose. It usually uses two of its four turbines units (Units 1 and 4) with the need of a flow of 1364 cfs. This amount is passed through the turbines and returned entirely to the main stem Savannah River (about two thirds of the length of the shoals).

There are three mills downstream of the City's intake. They are Sibley, King, and Enterprise. All these mills have turbines that are driven by water in the Canal. All return the water used back to the main stem Savannah River downstream of the shoals. Sibley Mill needs a flow of 1024 cfs; King needs approximately 880 cfs; and Enterprise needs a flow of approximately 560 cfs.

At the current level of Thurmond release (3600 cfs), if there is no incremental flow between the dam and the Canal inlet, then 1500 cfs would have to be left to pass the shoals. That leaves only 2100 cfs to go through the Canal. After the City turbines and intake, there would be less than 800 cfs left in the Canal.

Under the proposed release strategy, Thurmond release would be reduced to 3100 cfs from October through February. If the City operates the gates to pass 1500 cfs to the shoals, the amount of water going through the Canal would be 1600 cfs, assuming little incremental flow. This will be enough to sustain the City's water supply operations. However, after that, there would be less than 300 cfs left to go through the rest of the Canal, and the operations of the mills will be impacted.

We understand that the mills are connected to the power grid and alternative power is available in case their generating capacity is limited.

Impact to Water Quality

To assess the potential impact on water quality of the proposed operation, Georgia EPD, in coordination with SCDHEC and SCDNR, has performed water quality (dissolved oxygen - DO) modeling of both the Savannah River downstream of Thurmond Dam and the Savannah Harbor. The modeling results indicate that the seasonal reduction of Thurmond release would not cause water quality problems in the river or the harbor.

1. Savannah River downstream of Thurmond Dam

The first model simulation has been conducted with 2007 meteorological data, 2007 tributary inflows, 2007 Thurmond release data, and waste load discharges and water withdrawals as recorded in 2006. This run was performed to see how well the model is calibrated to observed DO data. Figs. 10 and 11 show the observed DO data (red squares) measured in 2007, which never went below 6.5 mg/L and 6.29 mg/L at River Mile (RM) 119 and RM 61, respectively, versus the approximate calibration run. It is an approximate calibration run since the model did not include

2007 discharge and withdrawal data, but rather that of 2006. Despite the approximation of this model run, the results indicate that the model has been calibrated relatively well.

Second and third model simulations were conducted with 2007 meteorological data, 2007 tributary inflows, and waste load discharges and water withdrawals as recorded in 2006. However, these model scenarios incorporated Thurmond releases of 3,600 and 3,100 cfs.

Figs. 12 and 13 show the results of the 3,600 cfs simulation. Under a Thurmond release of 3,600 cfs, the simulated DO concentrations at RM 119 were predicted to be above 5 mg/L throughout the year (Fig. 12). Fig. 13 shows simulated DO concentration at River Mile 61 under a Thurmond release of 3,600 cfs. Again, the simulated DO concentrations were predicted to be higher than 5 mg/L throughout the year. The water quality model shows that the 5.0 mg/L DO standard would not be breached by a Thurmond release of 3,600 cfs.

Figs. 14 and 15 show the simulated DO concentrations at River Mile 119 and River Mile 61 respectively, under a Thurmond release of 3,100 cfs. Even though we do not propose a reduction of Thurmond release in the summer time, our model indicated that there would not be a DO problem throughout the year. For the cooler months from October to February, DO concentration would always be higher than 6.0 mg/L and almost always higher than 7.0 mg/L at both River Mile 119 and River Mile 61.

We need to point out that the water quality model used in this analysis does not contain any modules simulating algal activity in the river. This lack of simulated algal activity means that our model tends to give overly pessimistic DO concentrations. It is highly likely that field data will provide higher DO concentrations than the model predicted.

The proposed action includes a continuation of 3,600 cfs release from Thurmond Dam in the months of March through September and a 3,100 cfs reduced release from Thurmond Dam in the cooler seasons (October through February). This action will not result in any adverse change in DO concentration in the warmer months. We suggest that monitoring stations be set up at locations along the river to monitor the change of DO concentration along the lower reaches, if the proposed operation is adopted. We also suggest that adaptive management be used as part of the Corps' operation. If field observation indicate any problem with DO concentration, then prompt actions can be taken to mitigate the adverse conditions.

2. Savannah Harbor

Two water quality related effects of lower Savannah River streamflows resulting from reduced Thurmond Reservoir releases were assessed. These were elevated chloride concentrations at the City of Savannah municipal water intake on Abercorn Creek, and dissolved oxygen concentrations in the Harbor.

The City of Savannah's municipal water intake is located on Abercorn Creek approximately two miles from the Savannah River. The City of Savannah is concerned about distributing water to its customers, particularly industries, when chloride concentrations in Abercorn Creek are greater than 12 milligrams per liter (mg/L). Such concentrations have been shown to cause scaling in boilers.

Sources of chloride in Abercorn Creek are upstream inflows from the Savannah River, and salinity intrusion from the downstream Savannah Harbor estuary. Studies have shown a good relationship between River flows at the U.S. Geological Survey's Clyo, Georgia stream gage location and chloride concentrations. Results have shown that the Savannah River contains approximately 10 mg/L of chloride during low flows, and 4 mg/L during high flows as a result of greater dilution. Therefore, it is during low flow periods where River chloride concentrations are as high as10 mg/L when salinity intrusion from downstream can cause an additional 2-4 mg/L in the vicinity of the intake and exceed the 12 mg/L threshold. Analysis of the historical chloride data collected at the City's intake shows that during drought years the number of samples with chlorides exceeding 12 mg/L ranges from 21 to 58 percent, and concentrations have approached 19 mg/L.

Lowering releases from Thurmond Reservoir, by itself, does not create higher chloride concentrations at the City of Savannah's water withdrawal. Rather, it is the combination of low releases from Thurmond Reservoir and low streamflows from the downstream watershed that create a condition for elevated chloride concentrations at the City's withdrawal. Therefore, the proposed reservoir operation schedule will not improve conditions for chloride concentrations at the City's intake, and with sufficient downstream inflows these conditions should remain unchanged. However, given the existing sensitivity of the City's intake to chloride concentrations greater than 12 mg/L as shown by the historical exceedances of this threshold, proposed reservoir operation combined with low downstream inflows might increase the number and magnitude of chloride concentrations greater than 12 mg/L at the City of Savannah municipal water withdrawal. Therefore, it is recommended that Savannah River flows at Clyo and chloride concentrations at the City's water intake be monitored closely to assess the effects of reservoir operation.

The effect of the proposed Thurmond reservoir operation on dissolved oxygen concentrations in Savannah Harbor was evaluated using the Savannah Harbor Model. Savannah River Model streamflow and water quality results provided input for the upstream boundary of the Savannah Harbor Model. Model results and the effects on dissolved oxygen concentrations were evaluated at the U.S. Army Corps of Engineers' dock located in the Harbor. The results were compared to the existing coastal fishing classification whose dissolved oxygen criteria is no less than 3.0 mg/L during June through October, no less than 3.5 mg/L in May and November, and no less than 4.0 mg/L during December through April. The results are shown in Figure 16. With respect to Dissolved Oxygen Standards applicable to the Harbor, at the present time, the Savannah Harbor is under a Total Minimum Daily Load for Georgia which indicates 0 assimilative capacity available for the NPDES permitted wastewater treatment system dischargers. The TMDL is based on a 1989 Georgia

seasonal Dissolved Oxygen standard which was never approved by the EPA. The GAEPD is in the process of revising the Harbor DO standard which will provide some assimilative capacity for the dischargers, and be similar and consistent with the South Carolina DO standard. Harbor dissolved oxygen monitoring will continue and impact to harbor dissolved oxygen attributable to seasonal dam releases will be evaluated and those operations modified as appropriate.

Other Potential Impacts

Since a seasonal deviation from the 3,600 cfs Thurmond release does not constitute a significant change in operations of the system, we do not foresee any impacts on other aspects and other water users of the Savannah River Basin.

We are willing to work with other resource agencies to address such concerns, if additional stakeholder groups raise concerns. We believe technical tools, such as WASP model and other models exist and are available for use to address salinity, temperature, and other issues.

Table 1. Major facilities along the main stem Savannah River and their tolerance of low elevations and flow rates

FACILITY NAME	INVERT ELEVATION (FT-MSL)	MINIMUM ELEVATION (FT-MSL)	NOTES	CORRESPONDING FLOW TO MIN ELEV. (CFS)
Columbia County			Their withdrawal is upstream from the Stevens Creek Dam.	
Augusta Canal			The necessary flow to support the municipal water withdrawal is 600-800 cfs. There is a deisel back-up pump but it is not capable of providing the full supply requirement. At some flow rate the downstream electric generation will be halted.	~1600 cfs in the Canal + 1000 cfs in shoal
Edgefield County	149.50	149.50	1989 Drought Plan. This value was confirmed by SCDHEC.	
City of Augusta		119.5		
City of North Augusta	106.00	109.00	Minimum elevation value came from the New Savannah Bluff Lock and Dam Project Disposition Report.	1000 cfs at elevation 109 ft
South Carolina Electric and Gas	106.00	105.50	Minimum elevation value came from the New Savannah Bluff Lock and Dam Project Disposition Report.	900 cfs at elevation 106 ft
PCS Nitrogen	97.75	103.90	PCS Nitrogen and DSM Chemical share the same intake structure. A minimum elevation value of 110	1300 cfs at elevation 110 ft

			came from the New Savannah Bluff Lock and Dam Project Disposition Report. Actual numbers came from a contact with PCS Nitrogen.	
DSM Chemicals	97.75	103.90	PCS Nitrogen and DSM Chemical share the same intake structure. A minimum elevation value of 110 came from the New Savannah Bluff Lock and Dam Project Disposition Report. Actual numbers came from a contact with PCS Nitrogen.	1300 cfs at elevation 110 ft
General Chemical	110.20	111.00	Minimum elevation value came from the New Savannah Bluff Lock and Dam Project Disposition Report.	1800 cfs at elevation 111 ft at DSM Chemical
Kimberly Clark		109.00	Minimum elevation value came from the New Savannah Bluff Lock and Dam Project Disposition Report.	1060 cfs at elevation 109 ft
International Paper	94.00	94.00		2800 cfs at elevation 94 ft
Savannah River Site	79.00	79.00	Latest information indicates that 79 ft is sufficient	3400 cfs at elevation 81 ft, 2300 cfs at elevation 79 ft
Plant Vogtle	70.00	70.00		always met
Savannah Electric-Plant McIntosh	7.50	7.50		3500 cfs at elevation 7.5 ft
Georgia Pacific	-1.00	5.16	Georgia Pacific stated that their minimum operational level is equivalent to a gage height of 2.0 feet at Clyo. Since the gage datum at Clyo is 13.39 feet-msl this results in a minimum elevation at Clyo of 15.39 feet-msl which is equivalent to a Savannah River flow of 3300 cfs. This corresponds to a water surface elevation of 5.16 ft-msl at the Georgia Pacific withdrawal.	3300 cfs per note
City of Savannah		-10.22		
Beaufort-Jasper		-3.0		

Table 2 Simulated hydrologic and operational scenarios

Scenario	A: Recorded 2007 Inflow	B: 2007 Inflow * 90%	C: Recorded 1988 Inflow	D: 1988 Inflow * 90%	B3300: Thurmond release of 3300 cfs	B3100: Thurmond release of 3100 cfs	D3300: Thurmond release of 3300 cfs	D3100: Thurmond release of 3100 cfs	B: 2007 Inflow 3100 Seasonal	D: 1988 Inflow 3100 Seasonal
Hydrology (Inflow to reservoir system)	Recorded 2007 inflow	Recorded 2007 inflow with a 10% reduction	Recorded 1988 inflow	Recorded 1988 inflow with a 10% reduction	Recorded 2007 inflow with a 10% reduction	Recorded 2007 inflow with a 10% reduction	Recorded 1988 inflow with a 10% reduction	Recorded 1988 inflow with a 10% reduction	Recorded 2007 inflow with a 10% reduction	Recorded 1988 inflow with a 10% reduction
Operation	Thurmond release of 3600 cfs	Thurmond release of 3600 cfs	Thurmond release of 3600 cfs	Thurmond release of 3600 cfs	Thurmond release of 3300 cfs	Thurmond release of 3100 cfs	Thurmond release of 3300 cfs	Thurmond release of 3100 cfs	Thurmond release of 3600 cfs in warmer months, and 3100 cfs in cooler months	Thurmond release of 3600 cfs in warmer months, and 3100 cfs in cooler months

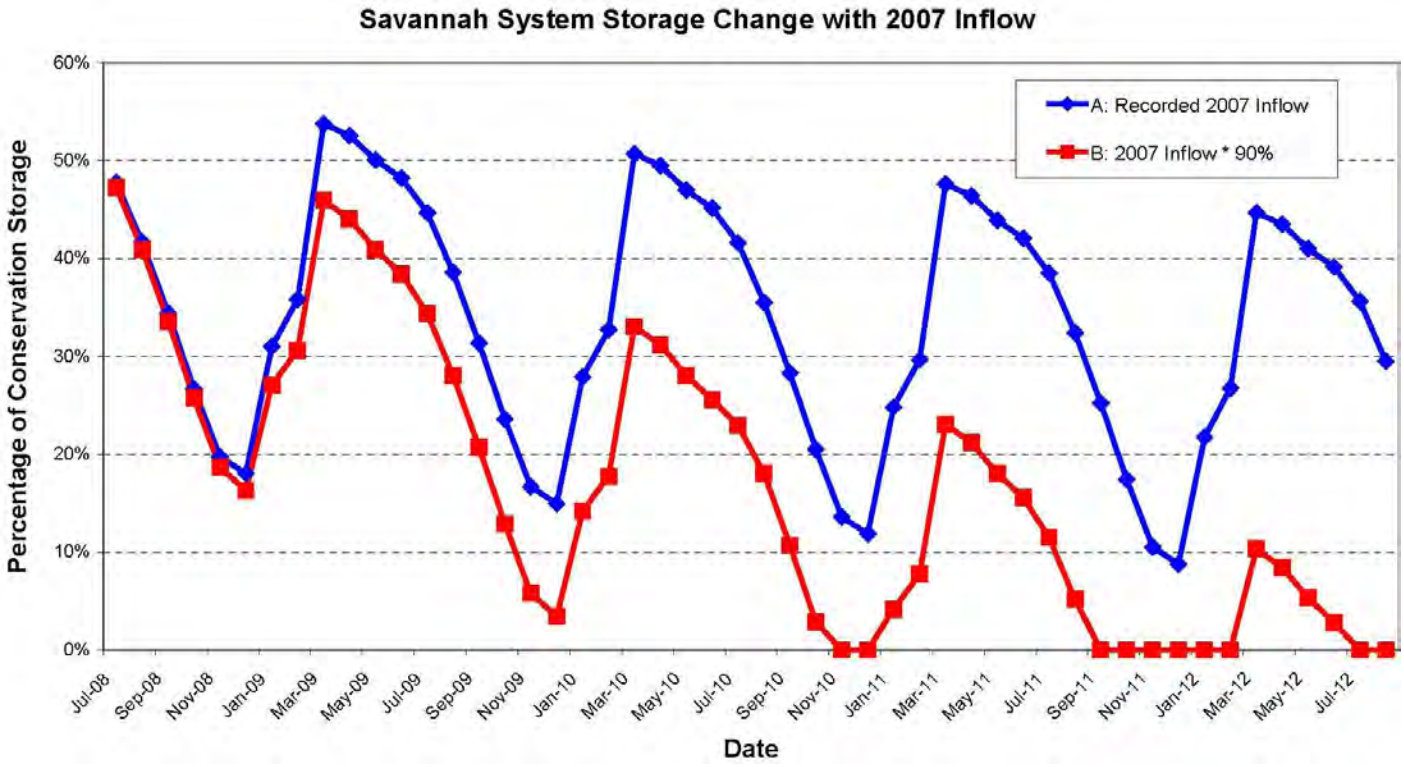


Fig. 1 Change of system conservation storage under 2007 hydrology and variation

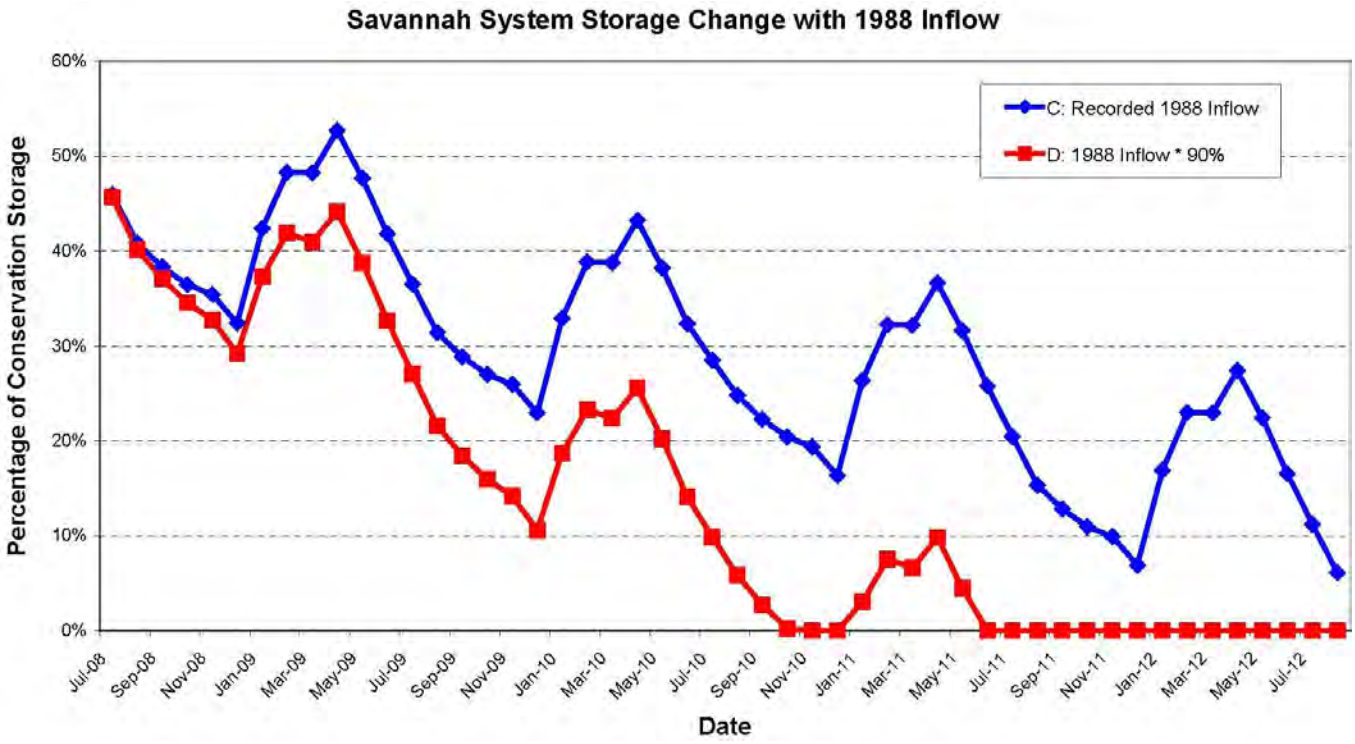
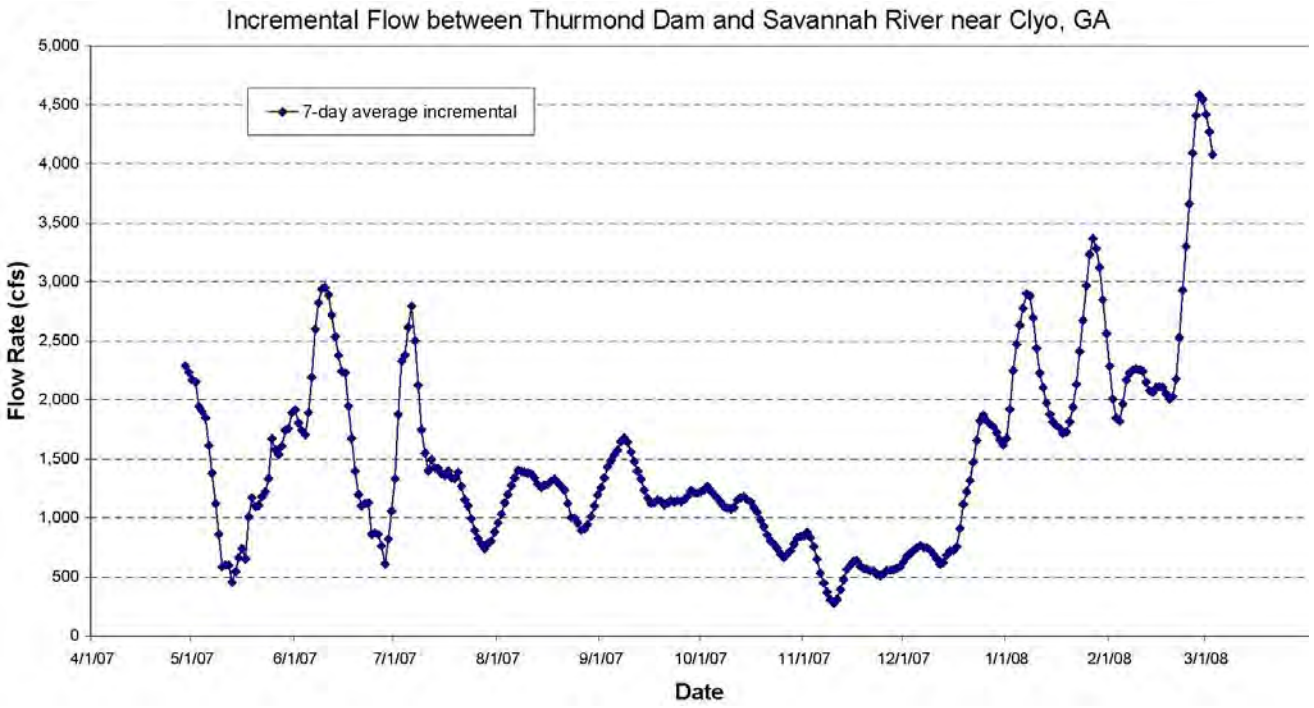


Fig. 2 Change of system conservation storage under 1988 hydrology and variation

Fig. 3 Incremental flow between Thurmond Dam and USGS Clyo gage in 2007-2008 period



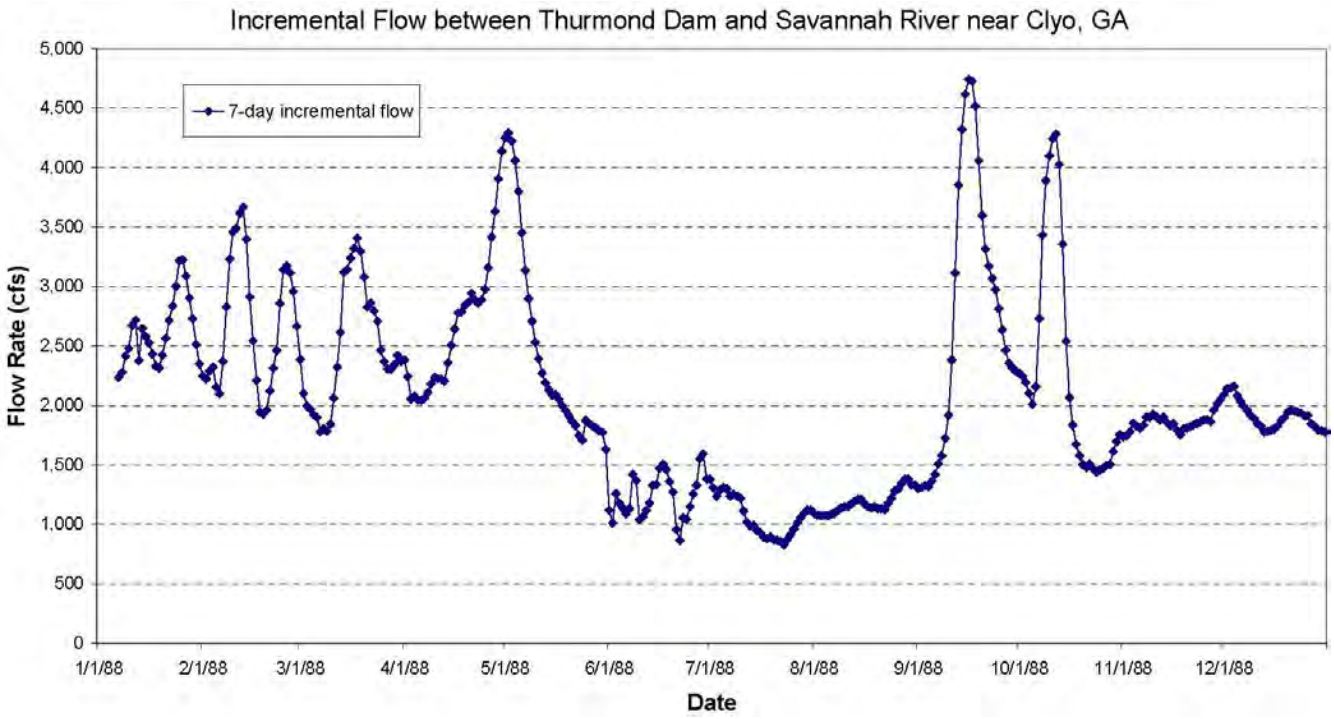


Fig. 4 Incremental flow between Thurmond Dam and the USGS Clyo gage in 1988

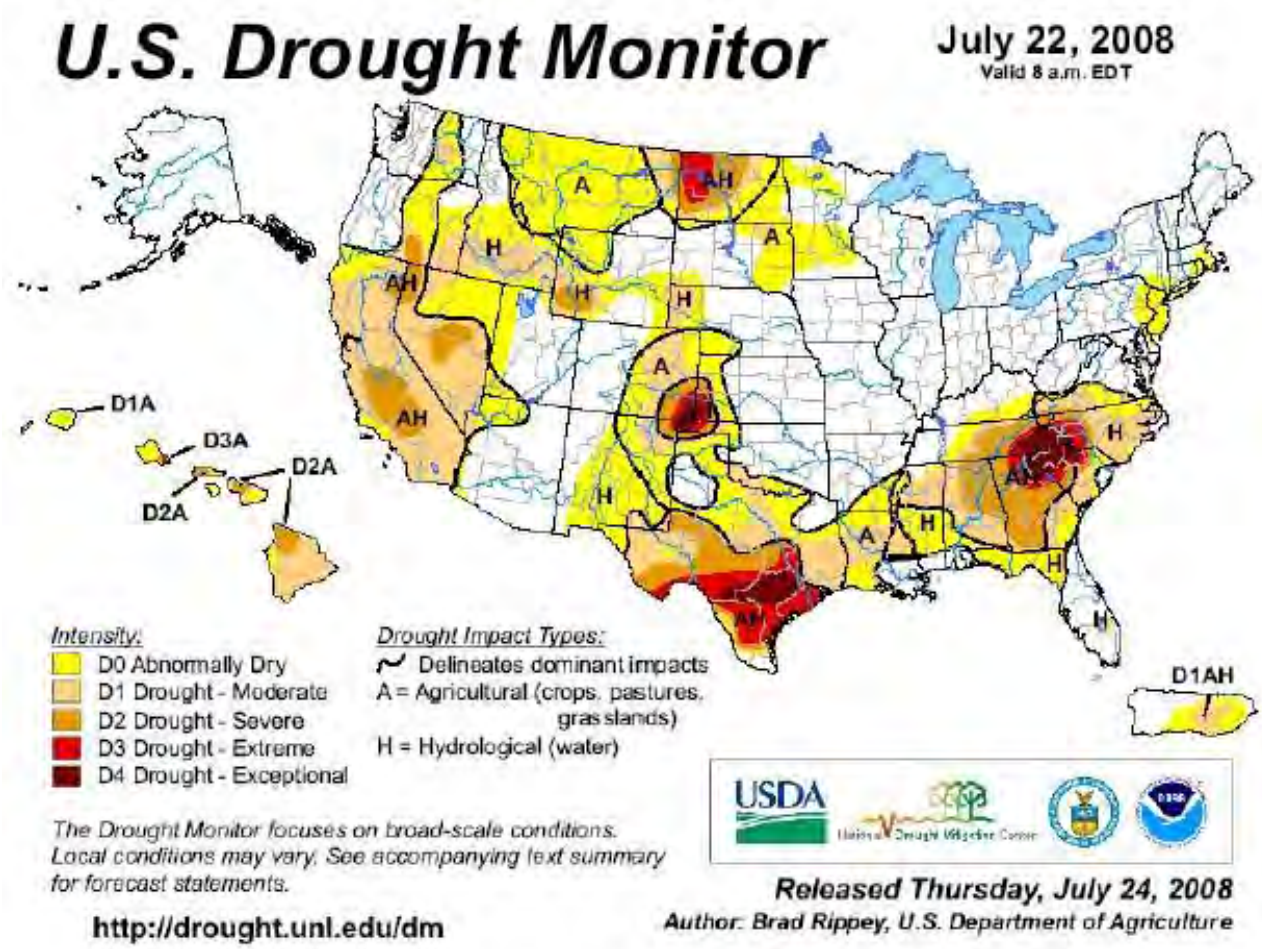


Fig. 5 U.S. Drought Monitor July 2008

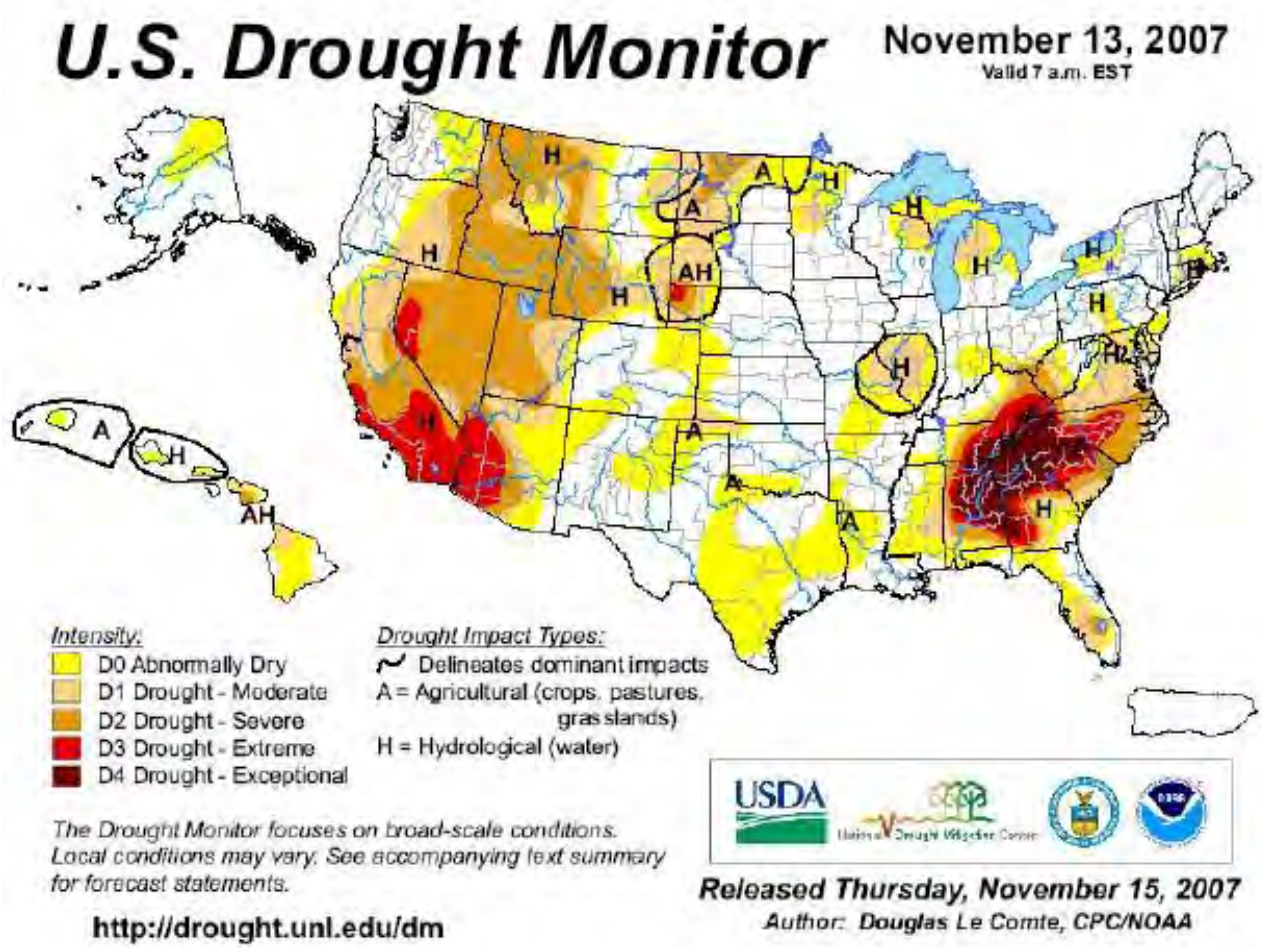
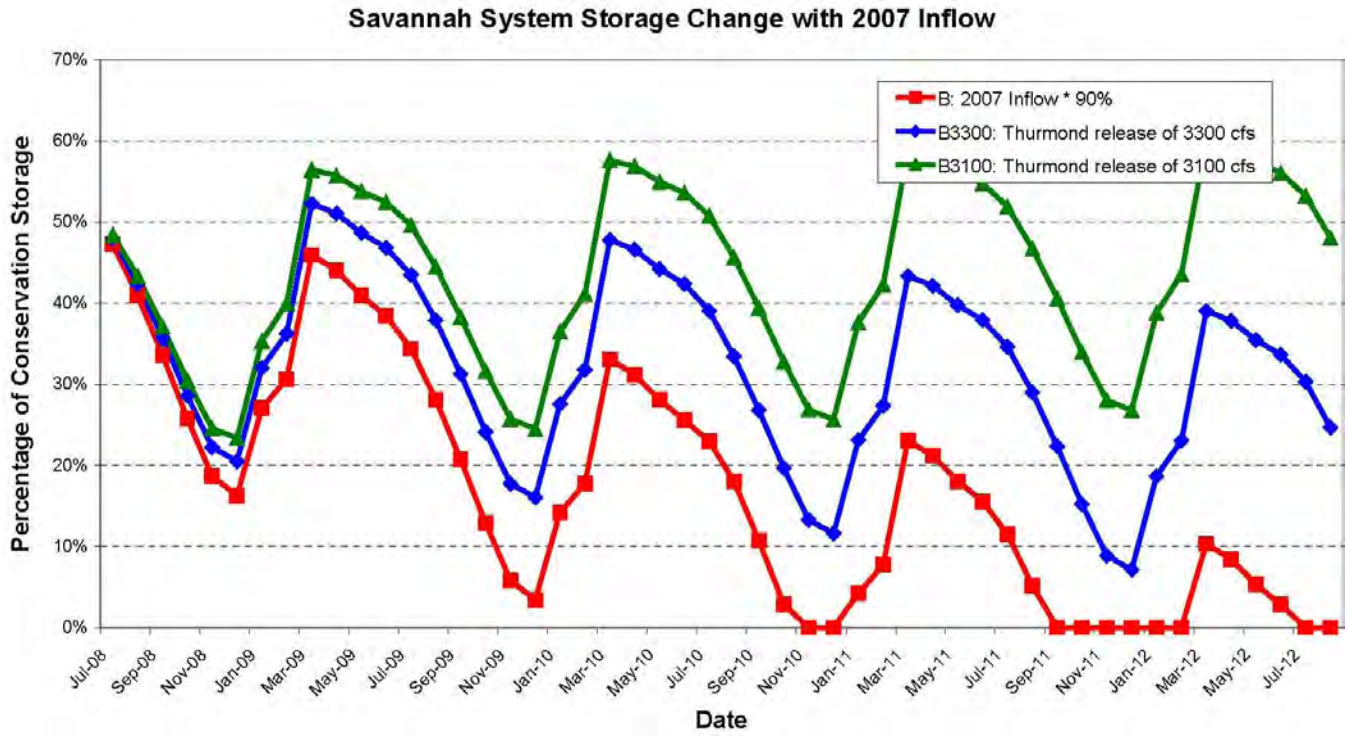


Fig. 6 U.S. Drought Monitor November 2007

Figure 7 Change of system conservation storage with 2007 hydrology and relief release at Thurmond



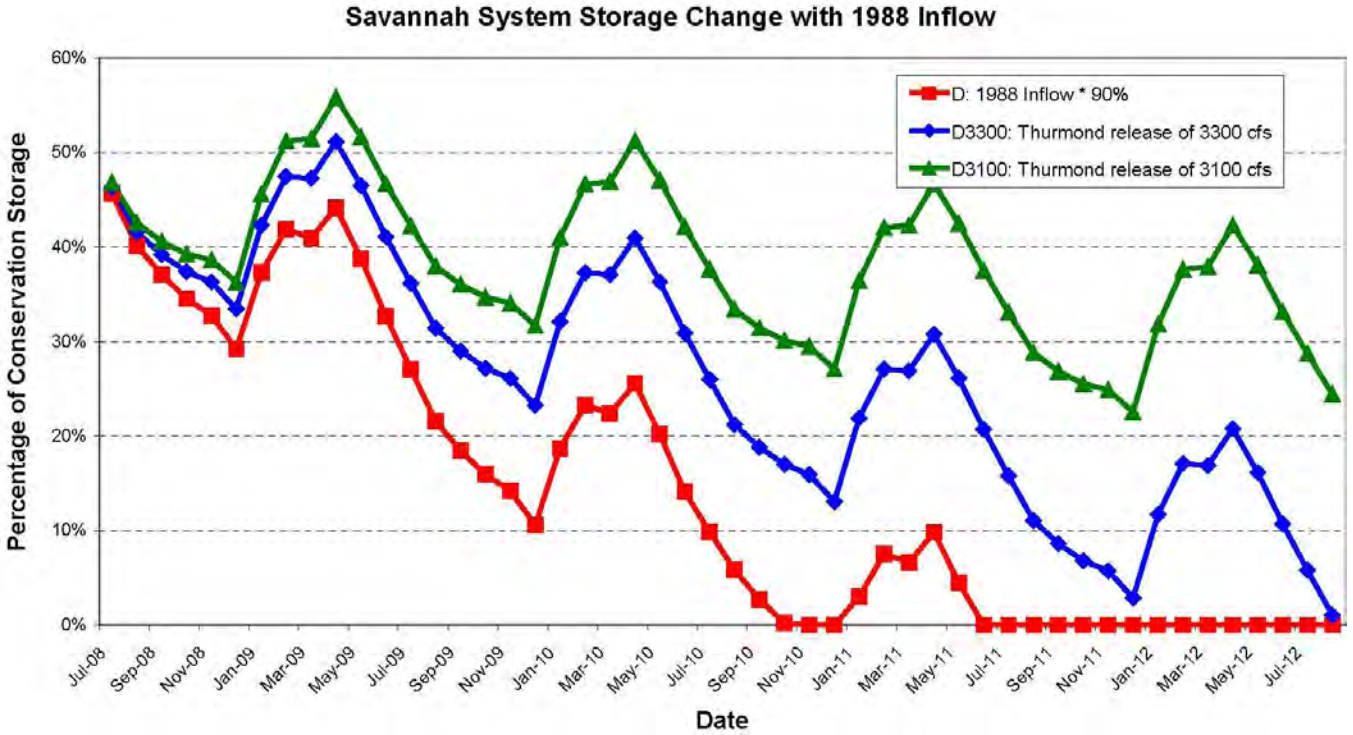


Fig. 8 Change of system conservation storage with 1988 hydrology and relief release at Thurmond

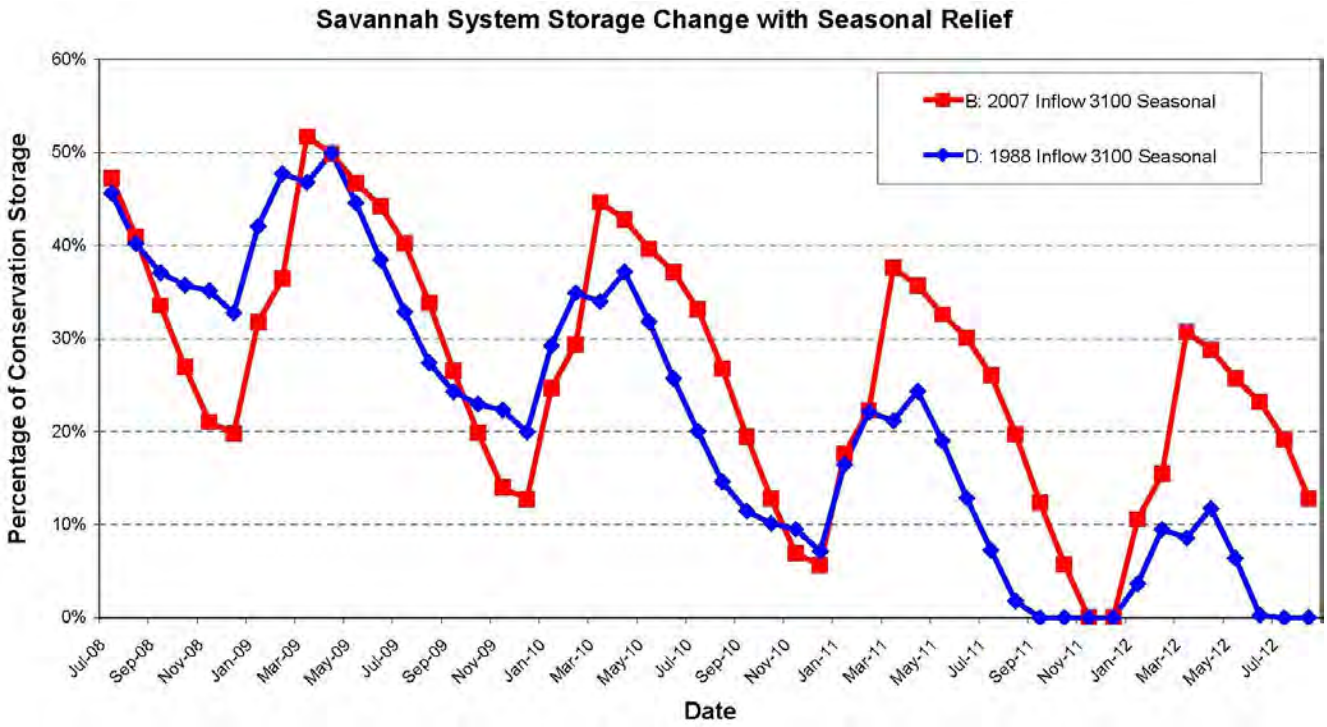


Fig. 9 Reducing Thurmond release to 3,100 cfs only in the cool season results in more stabilized system storage, even with worse-than-record inflow (90% of 2007 and 1998 recorded inflow)

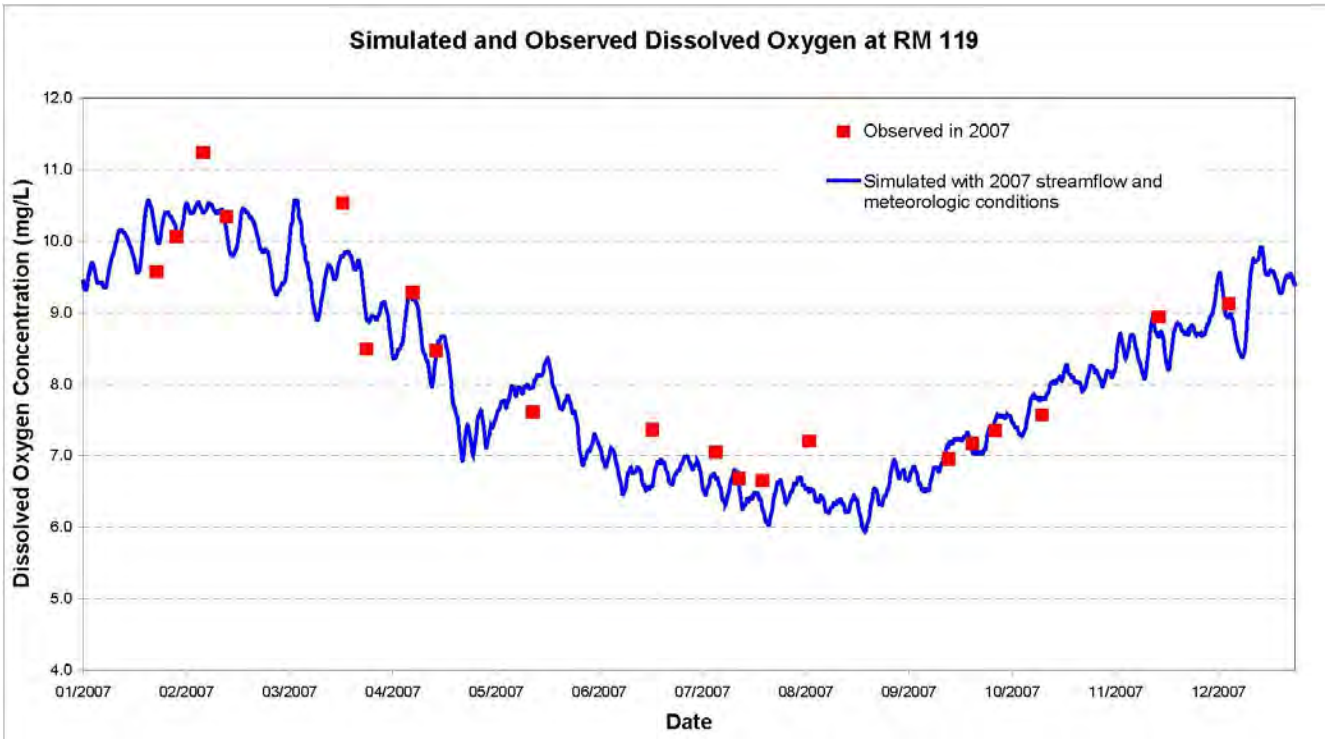
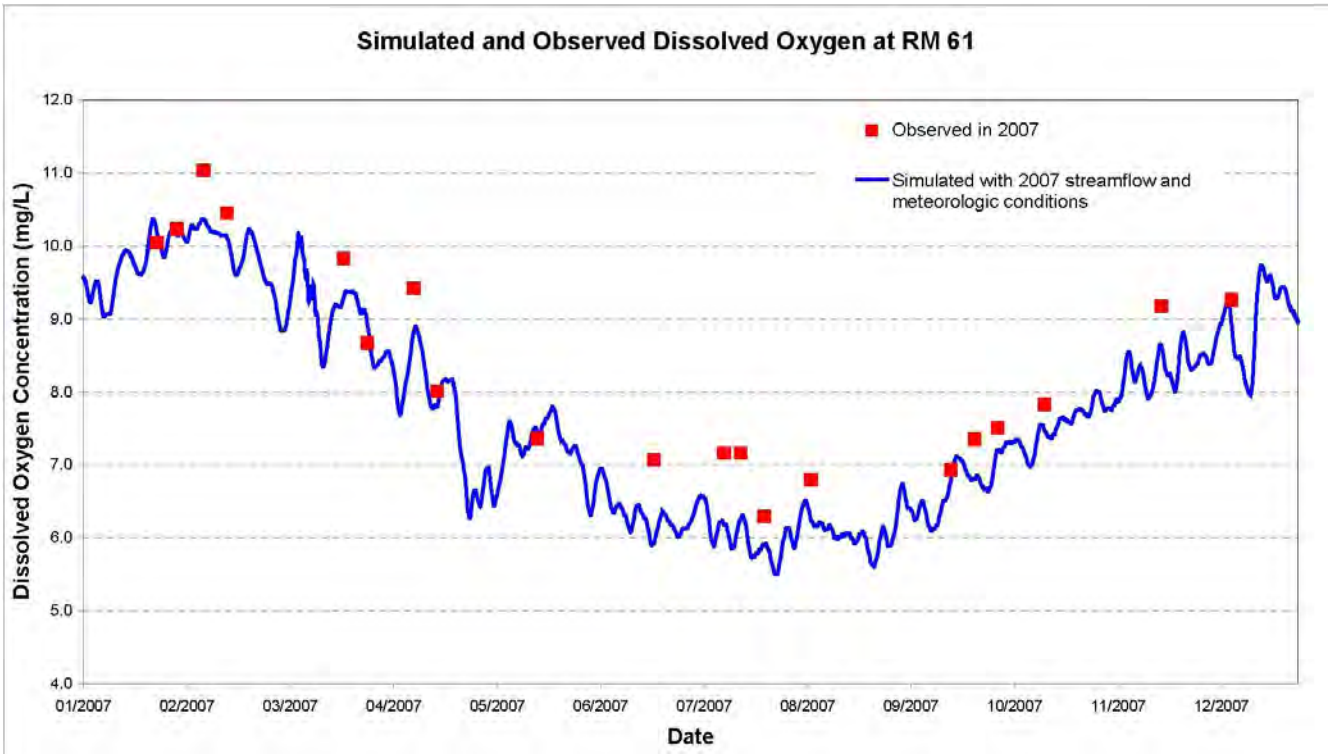


Fig. 10 Calibration of Savannah River water quality model at River Mile 119 (2007 Thurmond release)

Fig. 11 Calibration of Savannah River water quality model at River Mile 61 (2007 Thurmond release)



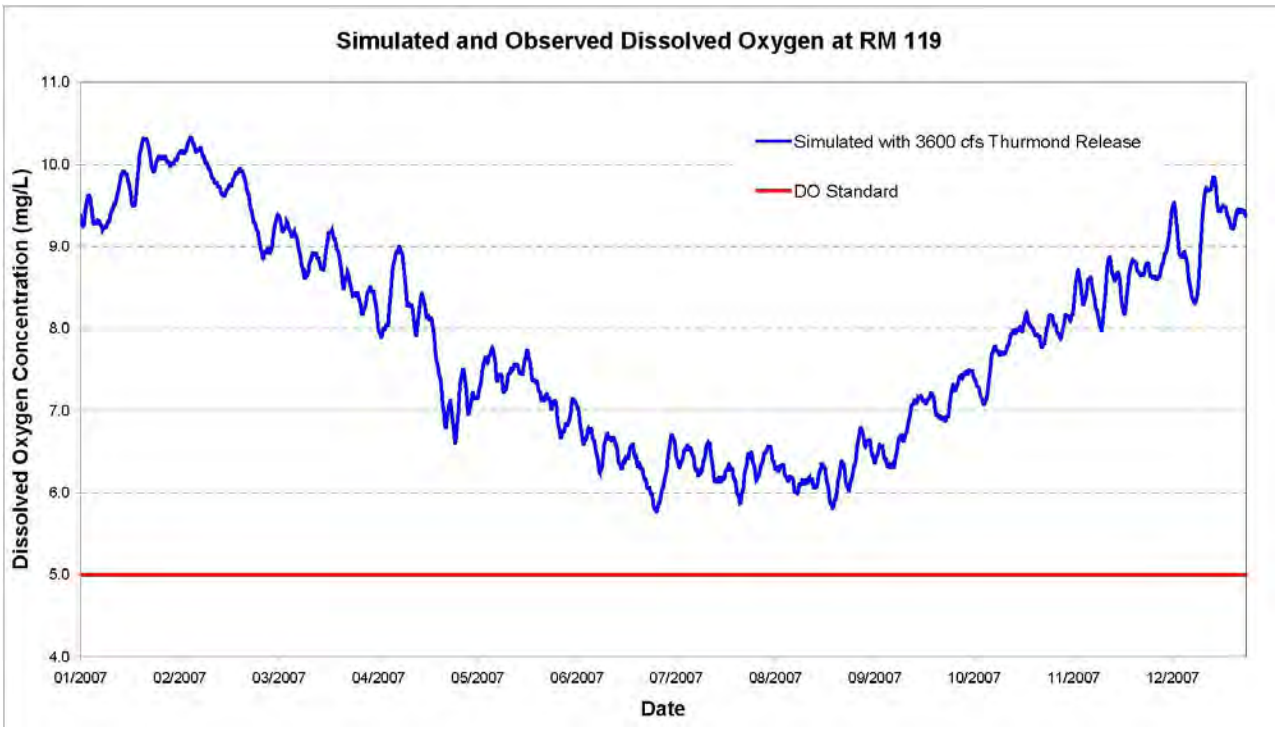


Fig. 12 Dissolved oxygen at RM 119 (with 2007 tributary inflow and meteorological data)

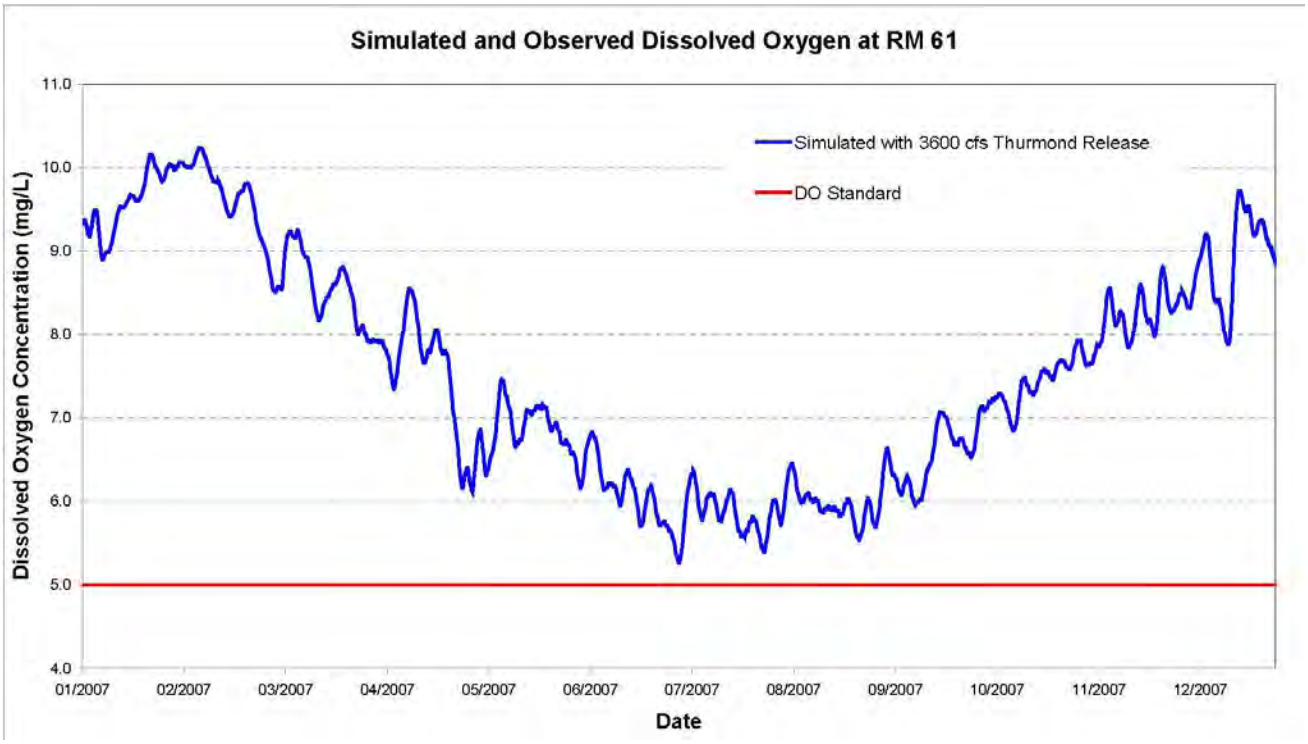


Fig. 13 Dissolved oxygen at RM 61 (with 2007 tributary inflow and meteorological data)

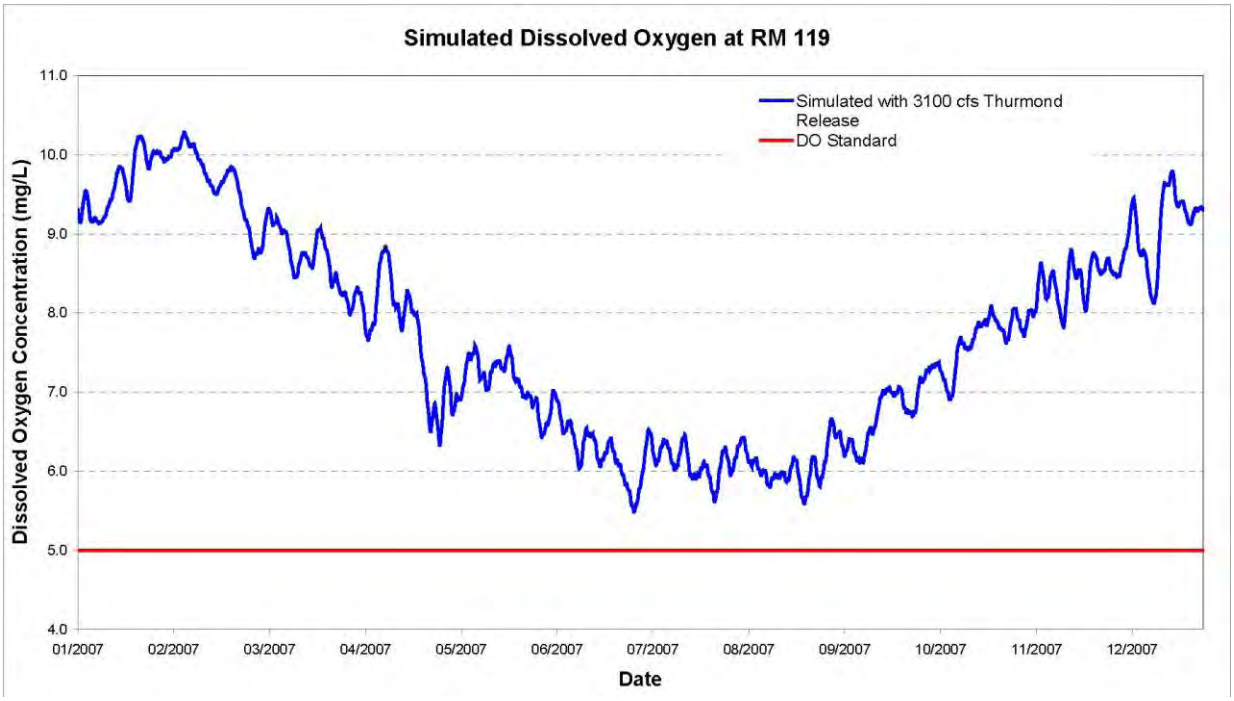


Fig. 14 Simulated dissolved oxygen at RM 119

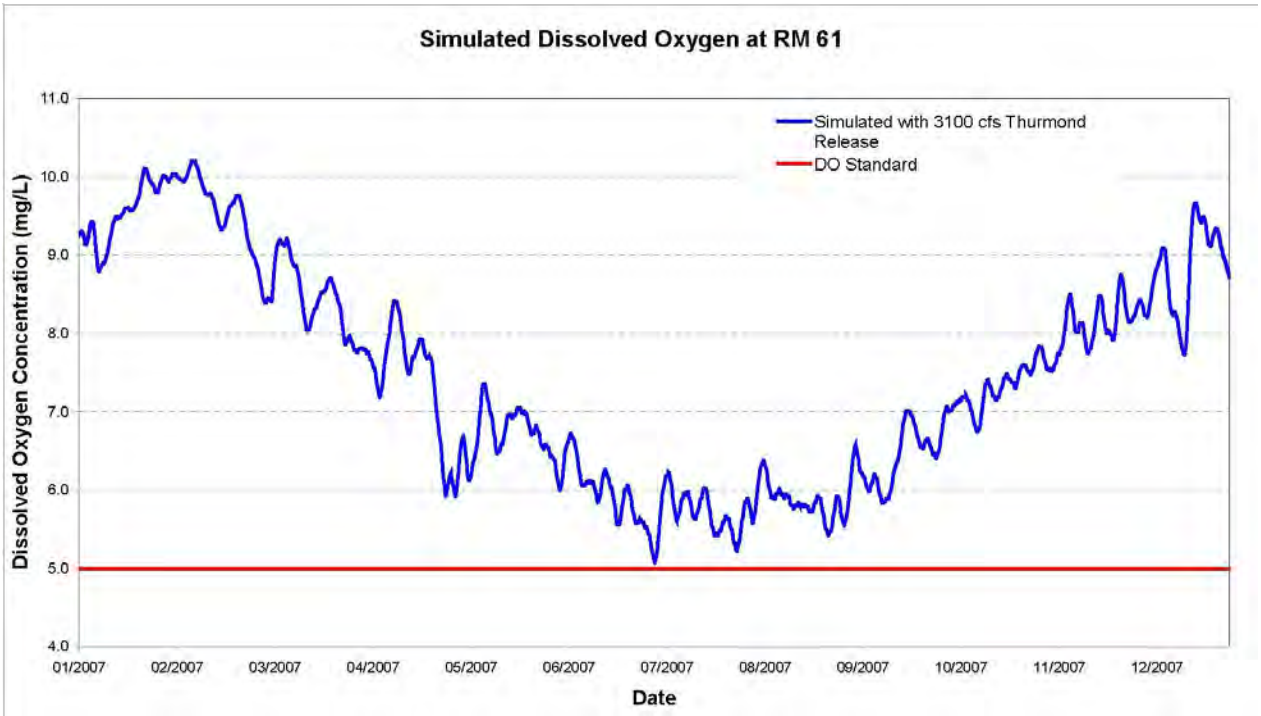


Fig. 15 Simulated dissolved oxygen at RM 61

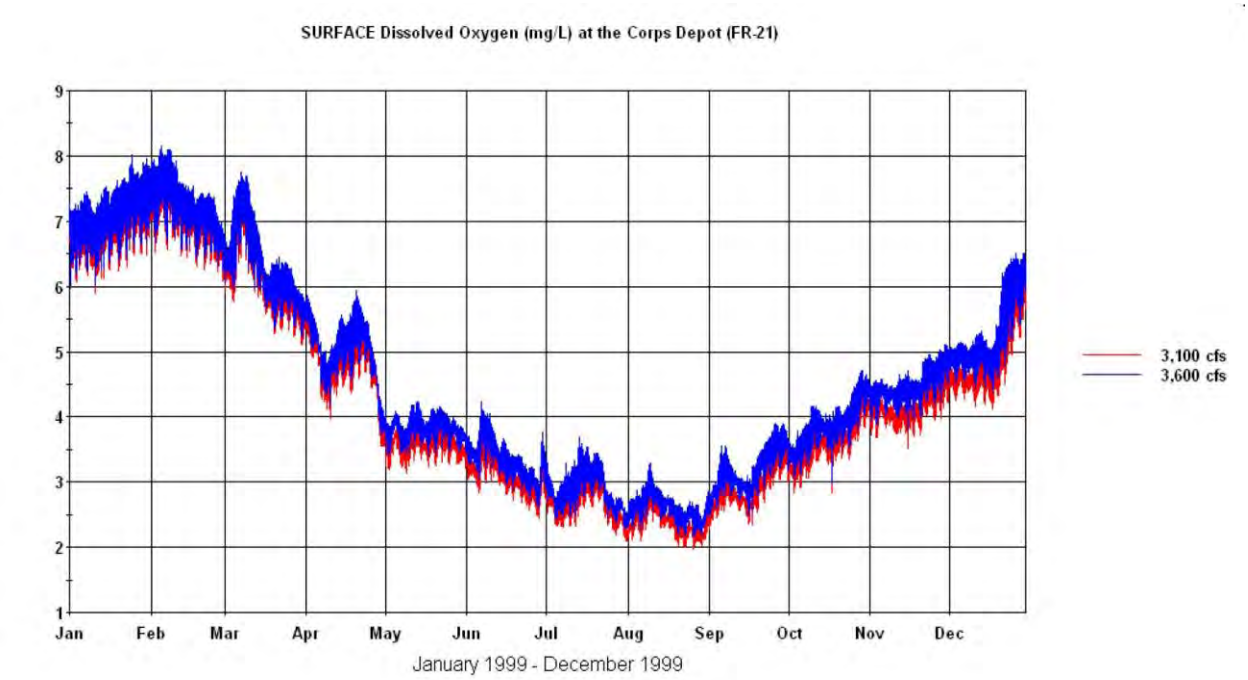
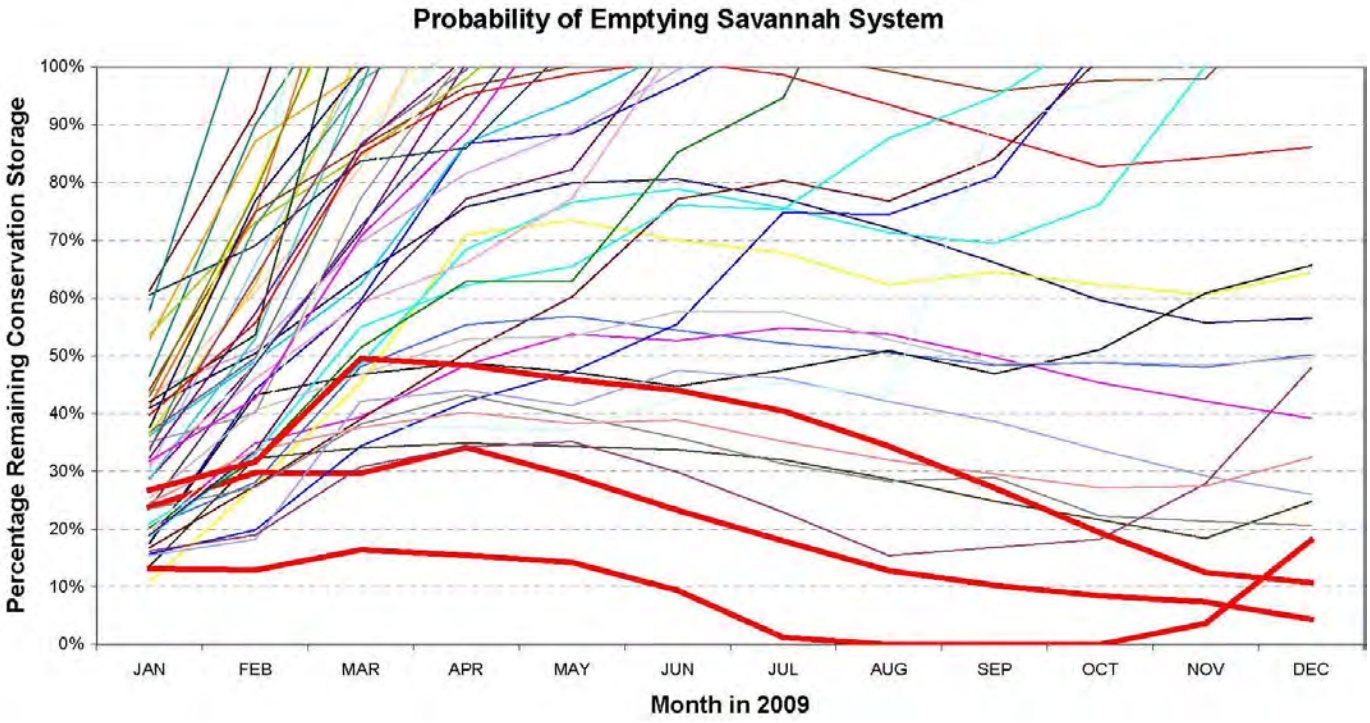


Fig. 16 Simulated surface dissolved oxygen in Savannah harbor

Fig. 17 Probability of refill (emptying) analysis reveals real danger of exhausting system conservation storage



Low Flow (Real Time) Management Plan
for Emergency Drought Response in the Savannah River Basin

A. Purpose/Background

As a result of extreme drought conditions in northeast Georgia, the Georgia Environmental Protection Division (GAEPD), South Carolina Department of Health and Environmental Control (SCDHEC), and South Carolina Department of Natural Resources (SCDNR) are proposing a temporary release reduction at Thurmond Dam from 3600 cfs to 3100 cfs beginning October 1st through the end of February. The Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impact seeks to minimize the depletion of reservoir storage during extreme drought when less than 35% of system conservation remains. Minimizing the depletion of storage will affect both Lake Hartwell and Thurmond Lake. Implementation of the proposed changes should result, at current drought conditions, with the delay of lake level reductions to Level 4 (outflow=inflow) until sometime during the time period of September through November 2011.

This Low Flow (Real Time) Management Plan provides a method for implementing the Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts, and for considering potential upward adjustments to the 3100 cfs (not to exceed 3600 cfs) should a decision be made that significant environmental impacts are occurring. The strategy and plan are not meant to replace the Army Corps of Engineers (ACE) current drought management plan, but instead are to be considered temporary modifications to the plan based on extreme drought conditions in the Savannah River Basin. Both documents were developed with input from multiple stakeholders.

B. Affected Environmental Elements/Low Flow Conditions

- Water quality standards (DO, pH, Temperature)
    - Important for maintaining aquatic biology
- Salt wedge location
    - Important for City of Savannah/BJWSA water supply intakes
    - Important for freshwater habitat maintenance
- Water levels at water intake structures
    - Important for all water users
- Habitat water levels/in-stream flow volumes
    - In shoal habitat within the Central Savannah River Area (CSRA)

Important for fish spawning and the Rocky Shoals Spider Lily
- In river bends that could be isolated
  Important for mussel habitat
- At critical in-stream fish habitat
  Important for determining impact to known fish spawning habitat, especially those species that are endangered

C. Baseline Monitoring Parameters/Low Flow Conditions

- Water quality
  - Continuous sonde data
    dissolved oxygen
    pH
    temperature
    specific conductance
- Water quantity (Savannah River flow)
  - Continuous discharge measurements
  - Continuous water levels
    At critical habitat locations
    At water intake structures

All current monitoring locations within the basin are shown in the Appendix.

D. Management Plan Elements

1. Dams and Diversions (operational strategies for river impoundments and the Augusta Canal System)

a). Storage and Discharge from J. Strom Thurmond Dam

GAEPD, SCDHEC, and SCDNR are proposing a seasonal release from Thurmond Dam constituting 3600 cfs from March through September and 3100 cfs from October through February. Beginning October 1st, discharges from Thurmond Dam would be transitioned down to 3100 cfs over a one-week period. Once the 3100 cfs objective is reached, it would be maintained until 28 February or until such time that 1) a listed monitoring site fails to meet its environmental target and 2) a decision is made by GAEPD, SCDHEC and SCDNR to modify the 3100 cfs. If such an event were to occur, discharges from Thurmond would be incrementally increased by 100 cfs/week until the impact is alleviated or 3600 cfs is reached. It's important to note however that any increase in flow up to and including 3600 cfs during the winter months could result in Level 4 arriving sooner than the currently predicted time period of September through November 2011.

b). Storage and Discharge from Stevens Creek Dam

Stevens Creek Dam attenuates the large, hourly discharge peaks from Thurmond Dam. The Stevens Creek Reservoir will continue to be managed to release as flat a schedule as possible equaling the daily average release at Thurmond Dam plus any local inflows.

c) Discharge between Shoals and Augusta Canal at the Augusta Diversion Dam

Diversions into the Augusta Canal are managed by the City of Augusta to maintain a minimum of 1500 cfs through the Shoals (FERC) from May though January and 1800 cfs in the remaining months. Three electronically controllable gates, operated by the City of Augusta, allow for instantaneous changes of flow to the canal. Based on current permit information on the City of Augusta intake, the City is allowed to withdraw no more than 45 MGD (about 70 cfs). The City has four turbines in its water supply operation. These turbines are driven by canal water, which in turn operates raw water pumps. Usually the City operates Units 1 and 4 to supply water needs at 1364 cfs. This amount is passed through the turbines and returned entirely to the main stem of the Savannah River (discharged into the last third of the shoals).

There are three mills using canal water downstream of the Augusta intake: Sibley, King, and Enterprise. All three mills have turbines used for hydropower generation that are driven by canal water. All water is passed through to the main stem of the Savannah River; in this case downstream of the shoals. Sibley Mill reportedly needs a flow of 1024 cfs, King 880 cfs and Enterprise 560 cfs.

At 3600 cfs (current release from Thurmond), and without consideration of incremental flows (very low), 1500 cfs would have to be provided at the diversion for the shoals (FERC), leaving 2100 cfs for the canal. After the City's turbines and intake, there would be less than 800 cfs remaining for the canal and downstream use. Reportedly, at this time, the mills are still able to operate.

Under the proposed seasonal flow strategy, a 3100 cfs flow would be released from Thurmond Dam from October through February. If the City operates the gates to ensure 1500 cfs through the shoals, the remaining water through the canal would be 1600 cfs (again assuming low incremental flows). While this should be sufficient water for Augusta's water supply needs, the downstream mills would be receiving less than 300 cfs for their hydropower operations.

Reportedly, the mills are connected to the power grid. Discussions will need to occur with the mills to determine their abilities to operate at the 3100 cfs and to use, if necessary, power from the grid during the low flow periods.

d) CSRA pool elevation/discharge over NSBL&D

Discharge from the Lock and Dam would be adjusted to maintain the pool within its current operating limits.

2. Water Management Targets

a). Water quality standards (DO, pH, temperature) within the lower Savannah River Basin (Table 1)

At this time, most of the continuous monitors within the mainstem of the freshwater portion of the river are not Internet accessible. Flow correlations to continuous data can only be established after data has been downloaded and analyzed. However, USGS operates a continuous monitor in the Savannah River at the USACE Dock (021989773). This monitor is located near where the dissolved oxygen concentration is typically the lowest in the Savannah River Basin. If a violation of water quality standards occurs, specifically for DO, pH, and/or temperature, a decision will be made by GAEPD, SCDHEC and SCDNR as to the need to incrementally increase the release from Thurmond Dam by 100 cfs/week until the standard is met or until 3600 cfs is reached..

Table 1. Water quality standards

Waterbody	Dissolved Oxygen	Temperature	pH
Savannah River	5.0 mg/L daily average 4.0 mg/L instantaneous	≤ 90 ºF	6-8.5
[1] South Carolina Regulations 61-68 & 61-69, Water Classifications and Standards			
[2] Georgia DNR EPD Regulations 391-3-6-.03, Water Use Classifications and Water Quality Standards			

b). Saltwater Wedge

The USGS operates a water quality monitor at I-95 near Port Wentworth (02198840). A maximum specific conductivity level of 10,000 microseimens measured at I-95 will be considered a management target for unacceptable migration of the salt-water wedge. Conductivity of 8000 microseimens was measured at I-95 during the 1998-2002 drought, so 10,000 is considered a valid and conservative number. The City of Savannah's intake water quality could be adversely affected by expansion of this wedge. Currently the City collects chloride data in Abercorn Creek. If the City's intake chloride concentrations increase to 16 ppm , then the City of Savannah will be consulted prior to any decision by GAEPA, SCDHEC and SCDNR to release additional water from Thurmond Dam. Typically the spring tide causes the largest intrusion of salt water upriver. If needed, benefit may come from releasing more water in time to meet the spring tide after which flows could be reduced back to the 3100 cfs.

c). Flows at Clyo/Savannah Harbor

There is a USGS gauge at Clyo (02198500), which also can be used as a management location. If the flows at Clyo are greater than 5000 cfs, there would be no need to increase flow above 3100 cfs from Thurmond Dam regardless of the water quality violations in the Harbor since the reduced flows from Thurmond Dam should not be the cause of the

violations. However, if the flow at Clyo is less than 4500 cfs then closer evaluation of the water quality standards is warranted. Should water quality violations be occurring, then a decision will need to be made by GAEPD, SCDHEC and SCDNR regarding incrementally increasing flows from Thurmond Dam by 100 cfs/week until either the water quality standard is met or 3600 cfs is reached. Finally, if the flow at Clyo is between 4500 and 5000 cfs, then an evaluation of the situation to determine if there are unusual circumstances such as higher than normal tides, off shore storms, will be performed to assist in deciding if increase flows from Thurmond are warranted to help solve the problem.

d). Water levels at Permitted Surface Water Intakes

Initial minimum stage requirements have been established for each permitted intake (see Table 2 below). Each permit holder will monitor intake performance. If intakes become impacted and/or unusable due to insufficient river stage, releases from Thurmond Dam will be as required to ensure that the river stage is sufficient to return the intake to service. This is a high priority consideration for protection of public health. Should a problem with an intake arise, consultations with the affected intake operator will also occur to discuss the possibility of employing emergency measures that may be successful in adapting to the lower flows.

Table 2. Intake requirements for entities along the Savannah River.

Facility Name	Invert Elevation	Minimum Elevation Required	Corresponding Flow to Min. Elev (cfs)
Columbia Cty			
Augusta Canal			1600 cfs in canal + 1000 cfs in shoals
Edgefield Cty	149.5	149.5	
City of Augusta		119.5	
City of North Augusta	106	109	1000 cfs at elevation 109 ft
SCE&G	106	105.5	900 cfs at elevation 106 ft
PCS Nitrogen	97.75	103.9	1300 cfs at elevation 110 ft
DSM Chemical	97.75	103.9	1300 cfs at elevation 110 ft
General Chemical	110.2	111	1800 cfs at elevation 111 ft at DSM Chemical
Kimberly Clark		109	1060 cfs at elevation 109 ft
International Paper	94	94	2800 cfs at elevation 94 ft
Savannah River Site	81	81	3400 cfs at elevation 81 ft; 2300 cfs at elevation 79 ft
Plant Vogtle	70	70	always met
Savannah Electric- Plant McIntosh	7.5	7.5	3500 cfs at elevation 7.5 ft
Georgia Pacific	-1	5.16	3300 cfs at elevation 15.39 ft (at Clyo)
City of Savannah		-10.22	
Beaufort-Jasper		+3	

modified from GAEPD, SCDHEC, and SCDNR Draft, *Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts*, July 2008

e). Sturgeon Protection

Sturgeon passage and spawning activity is monitored by SCDNR (fish are tagged and their movement closely observed). SCDNR can determine whether or not fish are successfully navigating toward their spawning habitat. Should problems result in sturgeon migration at lower flows, then a decision will need to be made by GAEPD, SCDHEC and SCDNR on releasing additional water up to the 3600 cfs for the required navigational period.

E. Habitat Water Levels/Instream Flow Volume Considerations

At this point, there is no correlation between discharge at the New Savannah Bluff Lock and Dam (NSBL&D) gauge and water elevation within the shoals. Water depths for fish spawning and habitat have not been established. There is no correlation between discharge and water elevation/depth within the cutoff bends which may affect mussel habitat. There is also no correlation between discharge and water elevation at critical in-stream fish habitat. Discharge measurements should be measured at the habitat site and correlated to a nearby USGS gauge.

The correlation between discharge and critical habitat will require measuring water depth and percent inundation at various discharges at the specific mussel and fish habitat sites. A mesohabitat study showing shoal habitat classifications/areas in response to a range of flows will need to be done. Fish passage monitoring for diadromous fish at the NSBL&D and sampling for juvenile diadromous fish, at least shad and striped bass in the Savannah River from the Augusta Dam downstream to appropriate sampling areas below the NSBL&D will need to be conducted. Juvenile/adult index could then be correlated with river basin flows from year to year. The Southeast National Sciences Academy (SNSA) is working with Augusta State, USFWS, TNC and others to determine these water level targets.

However, developing water level targets for the shoal habitat, the cutoff river bends, and at the critical instream fish habitat cannot be developed within the current time frame for this winter season. Information gathered this fall/winter could be used to develop water level targets that may be used if extreme drought conditions continue in the basin.

F. Monitoring Locations/Communication routes

The following table lists those parties that will be responsible for reporting to GAEPD on specific environmental targets. Upon review of that information, and discussion with SCDHEC and SCDNR, decisions will be made on notifying the ACE of appropriate adjustments to Thurmond release levels.

Table 3

Location	Target	Responsible Party
Shoals	Flow 1500 cfs	City Of Augusta
USGS 021989773	DO 5.0 mg/L daily average DO 4.0 mg/L instantaneous Temperature ≤ 90 ºF pH 6-8.5	GAEPD
USGS 02198840	Conductivity 10,000 µS/cm	GA EPD
Abercorn Creek	Chloride 16 ppm	City of Savannah
USGS 02198500	Flow < 4,500 cfs	SC DHEC
Various	Water level at the intakes	Intake operators
Various	Sturgeon migration	SC DNR

APPENDIX D

2008 AGENCY LOW FLOW

REQUEST LETTERS

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

October 1, 2008

Colonel Edward J. Kertis, Jr.
District Commander
U.S. Army Corps of Engineers
Savannah District
100 W. Oglethorpe Ave.
P.O. Box 889
Savannah, Georgia 31402-0889

RE: Savannah River Basin Drought
Request for Modification to the Drought
Contingency Plan Through
The Environmental Assessment Process (EA)

Dear Colonel Kertis:

As you are aware, since the US Army Corps of Engineers (USACE), Savannah District, first declared, in June of 2007, an Action Level 1 release from Thurmond Dam (4200 cfs), the State of Georgia Environmental Protection Division (GA EPD), along with the State of South Carolina, and other Federal, State and local stakeholders, have been routinely discussing and evaluating the drought crisis in the Upper Savannah River Basin via USACE bi-weekly conference calls. These calls have been very helpful and have allowed the participants to fully understand the status of drought in this region, predictions on persistence of the drought, how it might affect those users downstream of Thurmond dam, and how it is affecting the levels of Lakes Hartwell, Russell and Thurmond.

In response to continuing concerns regarding lake levels and predictions on when Action Level 4 (outflow =inflow) might be reached, in December of 2007, the GA EPD organized a Technical Coordination Group (TCG), comprised of Federal and State agencies (see attached list), whose charge was to analyze and evaluate possible alternatives to the existing releases as authorized under the USACE's Drought Contingency Plan. At that time, Thurmond Dam was being operated in accordance with a Modified Action Level 2 (3600 cfs minimum).

Through subsequent TCG meetings, and then just as critically, through breakout meetings involving the States of Georgia and South Carolina, a finalized proposal has been developed on how to extend storage in the lake system through a seasonal release strategy for Thurmond Dam. The attached document entitled Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts (authored by the GA EPD, the South Carolina Department of Health and Environmental Control and the South Carolina Department of Natural Resources) provides the rationale for extending the life of each conservation pool via a seasonal release from Thurmond Dam (3100 cfs from October through February, with a return to a release of 3600 cfs (daily) from March

through September). The other attached document entitled Low Flow (Real Time) Management Plan for Emergency Drought Response in the Savannah River Basin (accomplished with an even broader stakeholder group) provides a program for monitoring appropriate environmental targets with the potential to adjust the 3100 cfs should unacceptable impacts occur to those targets during the October through February time period.

Throughout this process, the USACE has not only been vital in providing predictive information on lake storage levels, but with providing information on how best to expedite implementation of a seasonal strategy using the USACE's Environmental Assessment (EA) process. To that end, I am requesting that the USACE submit to public notice, via its EA process, a strategy for operating the Lake Thurmond project as detailed in the attached documents. Since I consider this an emergency situation and one worthy of reduced EA timelines, I request that the EA process be accomplished, if possible, through a 15 day public notice. The release from Thurmond Dam is now at Action Level 3 (3600 cfs daily), so time is of the essence in initiating the EA process so that the USACE can quickly implement these modifications.

Your continued cooperation in addressing this critical situation is appreciated.

Sincerely,

Carol A. Couch
Director

CC: Mr. Robert W. King, Jr.
Deputy Director
South Carolina Department of Health & Environmental Control-EQC

Mr. D. Breck Carmichael, Jr.
Deputy Director
Wildlife and Freshwater Fisheries Division
South Carolina Department of Natural Resources

ATTACHMENT

D H E C

PROMOTE PROTECT PROSPER

C. Earl Hunter, Commissioner

Promoting and protecting the health of the public and the environment.

~~DE~~
OP
cf: DE
DC
LP
CS
LY
9:24 Oct 08

October 6, 2008

Colonel Edward J. Kertis, Jr.
District Commander
U.S. Army Corps of Engineers
Savannah District
100 W. Oglethorpe Ave.
PO Box 889
Savannah, Georgia 31402-0889

Re: Savannah River Basin Drought
Request for Modification to the Drought Contingency Plan
Georgia Department of Natural Resources letter dated October 1, 2008

Dear Colonel Kertis:

The referenced letter from the Georgia Department of Resources discussed the background and actions taken to date on this matter, so I will not restate them here. The South Carolina Department of Health and Environmental Control (SCDHEC) supports the proposed temporary changes to Lake Thurmond releases to mitigate drought impacts as outlined in Dr. Couch's letter, and also requests an expedited Environmental Assessment process.

If you have any questions, please let me know.

Sincerely,

Robert W. King, Jr., P.E.
Deputy Commissioner
Environmental Quality Control

CC: Dr. Carol Couch, Director
Georgia Environmental Protection Division

John Frampton, Director
SC Department of Natural Resources

South Carolina Department of

Natural Resources

John E. Frampton
Director

October 10, 2008

Col. Edward J. Kertis, Jr.
District Commander
U.S. Army Corps of Engineers
Savannah District
100 W. Oglethorpe Ave., PO Box 889
Savannah, GA 31402-0889

Dear Colonel Kertis:

As we all are aware, the upper Savannah River basin has experienced a severe drought for the past two and a half years that, despite conservation efforts by the Corps of Engineers, has lowered water levels in Hartwell, Russell, and Thurmond Reservoirs to near record-low levels.

These reservoirs are extremely important to both South Carolina's and Georgia's economies, natural resources, and the health of our citizens. Not only are the reservoirs themselves vital to South Carolina and Georgia, but during this severe drought, releases from the reservoirs are enhancing the flow of the Savannah River, thereby protecting downstream ecosystems, public water supplies, industries, and power plants.

The South Carolina Department of Natural Resources (SCDNR) has worked cooperatively with representatives from the Georgia Environmental Protection Division (GAEPD), the South Carolina Department of Health and Environmental Control (SCDHEC), the U.S. Army Corps of Engineers, and other agencies and stakeholders to develop a proposal to delay the complete depletion of the lakes' conservation pools. Together, the States of South Carolina and Georgia have finalized a proposal to reduce releases from Thurmond Reservoir during the winter months if this severe drought persists. The document entitled *Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts*, coauthored by GAEPD, SCDHEC, and SCDNR, and which has already been presented to you by GAEPD, describes the seasonal flow reduction agreed upon by both States.

Due to the importance of this matter, I am recommending that you implement this flow reduction plan as soon as possible.

Because the proposed release reduction from Thurmond Reservoir cannot be initiated until the Corps of Engineers complete an Environment Assessment, I am urging you to begin the Environment Assessment process immediately, and to make every effort to complete it as quickly as possible, including, if possible, the use of a 15-day public comment period. The opportunity for release reductions for October of this year has already been lost, but quick action by the Corps can allow these reductions to go into effect by November of this year.

Also, I would like to request that your staff work with representatives from both States in planning for the transition into Level 4 drought releases (outflow equals inflow) should this severe drought continue and our efforts to preserve the conservation pools prove unsuccessful.

I appreciate your serious consideration of this proposal.

Sincerely,

John E. Frampton
Director

cc: Michael G. McShane, Chairman, SCDNR Board
Robert W. King, Deputy Commissioner, SCDHEC
Noel Holcombe, Director, GADNR
Carol Couch, Director, GAEPD
Steve de Kozlowski, Interim Deputy Director, SCDNR-LWC
Bob Perry, Director, Office of Environmental Programs, SCDNR

APPENDIX E

U.S. FISH AND WILDLIFE

FLOW RECOMMENDATION LETTER

JUNE 4, 2009

United States Department of the Interior

Fish and Wildlife Service
105 West Park Drive, Suite D
Athens, Georgia 30606
Phone: (706) 613-9493
Fax: (706) 613-6059

JUN 04 2009

West Georgia Sub-Office
Post Office Box 52560
Fort Benning, Georgia 31995-2560
Phone: (706) 544-6428
Fax: (706) 544-6419

Coastal Sub-Office
4980 Wildlife Drive
Townsend, Georgia 31331
Phone: (912) 832-8739
Fax: (912) 832-8744

Mr. William Bailey (ATTN: PD-E)
Environmental Resources Branch
United States Army Corps of Engineers
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640

Subject: Savannah River flow recommendations below Thurmond Dam
FWS Log No. 41460-2009-FA-0650

Dear Mr. Bailey:

The U.S. Fish and Wildlife Service (Service) has reviewed your March 16, 2009, email correspondence requesting information on biological and physical flow thresholds in the Savannah River below the United States Army Corps of Engineers (COE) reservoirs. According to your email, this information will be used to evaluate a reduction of the releases below the COE reservoirs during future fall, winter, and spring periods, especially related to fish spawning. The COE recently reduced flows from the J. Strom Thurmond Reservoir (Thurmond) from a daily average flow of 3,600 to 3,100 cubic feet per second (cfs), as measured at Thurmond, from November 2008 to the end of January 2009 in accordance with the Temporary Deviation Drought Contingency Plan for the Savannah River Basin (COE 2008, Ed Betross, GDNR, 2009, personal communication). Per your April 6, 2009, phone conversation with the Service, the COE is now gathering information for the development of an Environmental Assessment (EA) in relation to extending this flow reduction period. We submit the following comments under the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 *et seq.*) and as technical assistance under the Fish and Wildlife Coordination Act (FWCA)(48 Stat. 401, as amended; 16 U.S.C. § 661 *et seq.*).

Endangered Species Act

On October 27, 2008, the Service concurred with your determination that the COE's reduction of flows from 3600 cfs to 3100 cfs from November 1, 2008 to February 28, 2009 was not likely to adversely affect federally-listed or proposed endangered and threatened species under our jurisdiction, including the wood stork (*Mycteria americana*) and manatee (*Trichechus manatus*). Based on the information provided thus far, the Service does not expect adverse affects to these

species for this new proposed action. The shortnose sturgeon (*Acipenser brevirostrum*) is federally endangered under the purview of the National Oceanic and Atmospheric Administration (NOAA) Fisheries for the ESA.

Fish and Wildlife Coordination Act

We are concerned about the effects of a proposed flow reduction in the Augusta Shoals and the lower Savannah River. The Service is particularly concerned about effects to the:

- federally endangered shortnose sturgeon;
- Federal species of concern robust redhorse (*Moxostoma robustum*). The robust redhorse, although not federally-listed, is the subject of a pre-listing recovery approach by the Robust Redhorse Conservation Committee (RRCC). The COE, along with the Service, is a member of the RRCC. The RRCC is a voluntary stakeholder partnership charged with the overall responsibility for directing the recovery of the robust redhorse. As a member, the Service has included comments about potential impacts to robust redhorse.
- striped bass (*Morone saxatilis*);
- Georgia State threatened Savannah lilliput (*Toxolasma pullus*). Additionally, Savannah lilliput is undergoing a status review to determine the need to be elevated to a Federal candidate species;
- Georgia and South Carolina State endangered brother spike (*Elliptio fraterna*);
- Georgia State threatened Altamaha arcmussel (*Alasmidonta arcula*);
- Georgia State threatened shoals spiderlily (*Hymenocallis coronaria*); and
- tidal freshwater habitat provided for wetland-dependant migratory birds on the Savannah National Wildlife Refuge.

The Service provided flow recommendations for the Savannah River below the COE reservoirs in our 2003 Draft FWCA Report to the COE. Those recommendations were divided by dry, average, and wet years and were developed to benefit the entire ecosystem downstream of the COE reservoirs. We recommend the COE review this document when developing their EA. The flows for the Augusta Shoals do not include the diverted flows into the Augusta Canal; therefore those diverted flows would need to be added to the Augusta Shoals flows listed below to generate the upstream flow releases. The recommendations for **dry** years are as follows:

Month	Augusta Shoals (cfs)	Savannah River-Floodplain (cfs)	Savannah River-Estuary (cfs)
January	4000	7500	8000
February	4000	7500	8000
March	4000 (pulse of 12500-14500)	7500 (pulse of 16000-18000)	8000 (pulse of 16000-18000)
April	4000 (pulse of 12500-14500)	7500 (pulse of 16000-18000)	8000 (pulse of 16000-18000)
May	2700	6200	6200

June	2700	6200	6200
July	2700	6200	6200
August	2000	5500	6000
September	2000	5500	6000
October	2000	5500	6000
November	2700	6200	6200
December	2700	6200	6200

Additionally, the Service's Draft FWCA Report recommended the COE address critical research needs for informed management of the lower Savannah River that were developed at the Savannah River Ecosystem Flow Workshop in April 2003 (Attachment A). Since the 2003 Ecosystem Flows Workshop and the Service's Draft FWCA Report, there has been little monitoring and research to refine these flow recommendations.

A summary of the monitoring and research that has been accomplished is compiled in Wrona et al. (2007). Additionally, the Southeastern Natural Sciences Academy sent you a summary of monitoring information that may be helpful to the development of your EA (Oscar Flite, Southeastern Natural Sciences Academy, 2009, pers. comm.). Other pertinent post-2003 FWCA Report research is as follows:

• Ongoing negotiations for the Federal Energy Regulatory Commission (FERC) relicensing of the Augusta Canal project involve flows that are based on levels equal to or greater than 3600 cfs at Thurmond Dam. Due to ongoing canal maintenance, the Augusta Canal is currently not operational and nearly all discharge released from Thurmond Dam currently flows into the Augusta Shoals. Using the pre-dam discharge dataset, 3100 cfs in the Augusta Shoals is expected to occur approximately every 1.5-2 years, on average. From an ecological perspective, the discharge in the Augusta Shoals without the water diversion is likely to occur within the natural range of variation. Shoal-inhabiting organisms are unlikely to be adversely affected, assuming water quality is unimpaired. However, once the Augusta Canal is operational, and depending upon how much water is provided to the Augusta Shoals by the City of Augusta, the discharge in the Augusta Shoals may not be within the natural range of variation and adverse impacts to aquatic populations may occur.

• Shortnose sturgeon are now known to spawn on gravel bars in the Savannah River downstream of the New Savannah Bluff Lock and Dam (NSBLD) as early as mid-February (Ed Eudaly, USFWS, October 27, 2008, written correspondence to Bill Bailey, COE).

• Robust redhorse in the Savannah River are known to initiate upstream spawning migrations in March when water temperatures are 10-12 degrees Celsius and spawn from May to mid-June at several gravel bars below NSBLD. The upper gravel bar is located at river kilometer (rkm) 299.4 and the lower gravel bar at rkm 283.7. Individuals were observed on the gravel bars in 2004 and

2005 when water temperatures were 16.6-21.8 degrees Celsius. They were observed in spawning areas with a mean depth of 0.74 meters [± 0.017 standard error (SE)], mean velocity of 0.24 meters/second (± 0.014 SE), mean slope of 0.07 (± 0.003 SE), mean substrate particle size of 14.3 millimeters (± 0.272 SE), and modal substrate size of 32.0 millimeters. Depth and velocity at the gravel bars varied with discharge at the NSBLD. Robust redhorse on the upper gravel bar were found consistently in the same areas regardless of water level. The spawning areas at the upper gravel bar remained underwater and flow was maintained under all observed levels of discharge, ranging from approximately 3000 to over 30,000 cfs, as measured at the United States Geological Survey (USGS) gage 02197000 (Savannah River at Augusta, Georgia). However, on the lower gravel bar, robust redhorse initiated spawning on the Georgia side of the bar and expanded spawning activity to the center and South Carolina edge as spawning intensity increased. Redd sites on the center and South Carolina edge of the bar were exposed and degraded by fluctuating water levels during the period of observation (T. Grabowski, 2006, Ph.D dissertation). Flow levels at 3600 cfs already limit the amount of available gravel bar spawning habitat, and flow reductions to 3100 cfs would be expected to exacerbate this loss (T. Grabowski, 2009, pers. comm.).

• The Nature Conservancy (TNC) has also collected some information regarding levels of discharge and correlations to exposure of the gravel bars mentioned above. Flow data should be correlated to gravel bar exposure by examining the data collected by Tim Grabowski and TNC.

• A portion of the robust redhorse population is also present above the NSBLD in the Augusta Shoals. Unlike their counterparts below the NSBLD, it appears these individuals do not make extensive migrations and remain in the Augusta Shoals year-round (T. Grabowski, 2006, Ph.D dissertation).

• As noted in your October 2008 Draft EA (COE 2008), a freshwater mussel survey of the Savannah River from the Augusta Shoals downstream to the tidewater region near Savannah (river mile 22.8) totaling thirty-nine individual survey sites was conducted in 2006 (The Catena Group 2007). Rare species detected include the State listed Altamaha arcmussel, the brother spike, and the Savannah lilliput. The brother spike was found in the Augusta Shoals and the mainstem Savannah River, and the Altamaha arcmussel and the Savannah lilliput were found within cut-off bends of the Savannah River.

• As we stated in our October 27, 2008, letter, the Savannah National Wildlife Refuge (NWR) provides habitat for an average 23% of South Carolina's waterfowl, based on mid-winter waterfowl surveys from 1990-2002. Freshwater (salinity less than 0.5 parts per thousand) is necessary to maintain maximum waterfowl use and provide essential habitat for wetland-dependent migratory birds on the Savannah NWR. Additionally, Savannah NWR has the legal mandate of providing freshwater to several adjacent landowners for agricultural and wildlife management purposes (Chuck Hayes, Savannah NWR, wildlife biologist, 2009, pers. comm.). Studies have concluded that freshwater coastal impoundments in South Carolina produce a

greater variety of marsh plants, many of which are desirable waterfowl food, than brackish impoundments.

• The recommended flow for "dry" years from the 2003 Draft FWCA report is set at a range of 6,000 - 6,200 cfs for the critical period for the Savannah NWR of August – December as measured at USGS gage 02198500 (Savannah River near Clyo, Georgia). The Service has reviewed the most readily available USGS salinity data (October 2006 - present) at USGS gage 021989784 (Little Back River above Lucknow Canal, near Limehouse, South Carolina), the entrance to the Freshwater Diversion Canal. Savannah NWR is already experiencing salinity spikes during these critical months ranging from > 0.5 - 3.2 parts per thousand (ppt), when flow at Clyo during these periods is much less than the lower recommended range of 6,000 cfs. It appears the salinity spikes are occurring with higher tides on a lunar cycle. Savannah NWR relies on high tides to fill the Freshwater Diversion Canal; thus, the impoundments are being inundated with saline water. These small increases in salinity on a repetitive cycle can have deleterious cumulative effects on the vegetation that Savannah NWR is managing to provide high-quality habitat for migrant birds. Further reducing flow in an already stressed environment could potentially have more severe and prolonged negative effects on the Savannah NWR.

• During our May 11, 2009, meeting, the effects of a flow reduction to salinity levels as they relate to blue crab (*Callinectes sapidus*) parasite issues was briefly discussed. The EA should examine this potential impact.

Conclusion

The Augusta Shoals area is important year-round habitat for many native riverine species, including the robust redhorse, the shoals spiderlily, and the brother spike. The Augusta Shoals require not only inundation, but also suitable current velocities to allow for survival and reproduction of aquatic organisms. We are unclear as to 1) the amount of flow that would be provided to the Augusta Shoals by the City of Augusta, and 2) if the agreed-upon flows to the Augusta Shoals would be implemented in full without a binding agreement involving the City of Augusta.

The gravel bars downstream of NSBLD serve as critically important spring spawning habitat for a multitude of riverine species, including the shortnose sturgeon and the robust redhorse. Gravel deposits are extremely rare in the main channel of the lower Savannah River (T. Grabowski, 2006, Ph.D dissertation). Suitable depths and velocities at these gravel bars need to be present to inundate, but also protect the suitability of, spawning habitat. Additionally, natural springtime flows need to be present to cue migratory fishes to initiate their upstream migrations.

Reduced flows have caused backwater and oxbow habitat to transition into sediment-laden areas colonized with vegetation. Backwaters and oxbows are habitat for many native freshwater mussels and the only known habitat for the Altamaha arcmussel and Savannah lilliput in the

Savannah River. Preliminary observations indicate a loss of connectivity occurs between these habitats and the main river at flows below 4,000 cfs (COE 2008).

Savannah NWR is already experiencing unsuitable salinity levels during the COE's current releases. The harbor is currently approximately twice its historic depth and Savannah NWR is unfortunately already experiencing salinity levels higher than ever anticipated at the northern intake of the Diversion Canal during these critical periods. The Service is concerned that a future reduction in flow will exacerbate the salinity conditions at Savannah NWR during their critical period of August-December. Cumulative impacts to salinity levels, including climate change and the proposed Savannah Harbor deepening, should also be considered.

We are aware of very little additional research and monitoring for informed management of the Savannah River since the Ecosystem Flows Workshop and the Service's Draft FWCA Report. If future seasonal flow reductions are deemed necessary for maintenance of water in the reservoirs during drought, the COE should initiate some of the recommended studies to better anticipate flow needs for all downstream resources.

In light of these concerns, and without our critical research needs addressed, we do not recommend a flow reduction to 3,100 cfs. Both the long duration and timing of the protracted period would be of concern. Additionally, if implemented in 2009, the proposed reduction would be in addition to the recent long-term, low-flow conditions, which could exacerbate environmentally stressful conditions and amplify otherwise negligible biological impacts. We appreciate the opportunity to comment during the planning stages of this project. If you have any questions, please contact staff biologists Lora Zimmerman (Charleston Field Office) at (843) 727-4707 ext. 226 or Alice Lawrence (Athens Field Office) at (706) 613-9493 ext. 222.

Sincerely,

Sandra S. Tucker
Field Supervisor
Georgia Ecological Services

Jane Griess
Project Leader
Savannah Coastal Complex

cc: Lora Zimmerman, USFWS, Charleston, SC
Amanda Hill, USFWS, Charleston, SC
Russell Webb, USFWS, Savannah, GA
Chuck Hayes, USFWS, Savannah, GA
Stephania Bolden, NOAA Fisheries, St. Petersburg, FL
Prescott Brownell, NOAA Fisheries, Charleston, SC
Ed Betross, GDNR, Thomson, GA

Oscar Flite, Southeastern Natural Sciences Academy, Augusta, GA
Amanda Meadows, TNC, Savannah, GA

References

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Grabowski, Tim. 2006. Reproductive ecology and seasonal migrations of robust redhorse (*Moxostoma robustum*) in the Savannah River, Georgia and South Carolina. A dissertation presented to the graduate school of Clemson University. May 2006. 73 pp.

The Catena Group. 2007. Freshwater mussel surveys, the Savannah River from Augusta to Savannah: South Carolina and Georgia. Prepared for: International Paper and the U.S. Fish and Wildlife Service, Hillsboro, North Carolina, December 17, 2007. 42 pp.

United States Army Corps of Engineers. 2008. Draft Environmental Assessment and Finding of No Significant Impact, Temporary deviation drought contingency plan, Savannah River Basin, Savannah District, October 2008. 65 pp.

Wrona, A. D. Wear, J. Ward, R. Sharitz, J. Rosenzweig, J.P. Richardson, D. Peterson, S. Leach, L. Lee, C. R. Jackson, J. Gordon, M. Freeman, O. Flite, G. Edison, M. Davis, and D. Batzer. 2007. Restoring ecological flows to the lower Savannah River: A collaborative scientific approach to adaptive management. Proceedings of the 2007 Georgia Water Resources Conference, March 27-29, 2007, University of Georgia. 12 pp.

Attachment A

Critical Research Needs Developed at the Savannah River Ecosystem Flow Workshop
April 2003

Shoals

- Real time streamflow gauging in shoals along with temperature: allows for the development of a streamflow-temperature model
- Fish, plant, invertebrate distribution and composition (and movement tied to flows over time)
- Physical dynamics during low and high flow extremes: informs sediment transport and deposition study
- Spiderlily flow needs
- Robust redhorse spawning habitat
- Atlantic sturgeon spawning and passage information along with shortnose sturgeon passage data in relation to flow
- Striped bass passage and thermal requirements as well as egg drift requirements for movement past New Savannah Bluff Lock and Dam

Floodplain

- Cross-sectional and/or spatial topography at fine resolution
- Vegetation community distributions
- In-channel survey of physical structure (woody debris, sand and gravel bars, etc)
- Location of gravel patches below New Savannah Bluff Lock and Dam and flow-habitat relationships
- Oxbows & sloughs – at what flows will water be exchanged with river, and how do these exchanges affect water quality
- Duration of inundation in floodplain after flood events
- Modify existing USGS streamgauges to include temperature, turbidity, dissolved oxygen
- Revisit COE cut-off bend study

Estuary

- Relate flow at Clyo to salinity distribution in estuary
- Fish community distributions, inter-tidal marsh conditions during high flow periods (similar to what has been done for drought period)
- Relate salinity conditions to inter-tidal/floodable habitat
- How does flow affect spawning and recruitment success for estuary-dependent (including diadromous) fish species
- Relationship between flow and dissolved oxygen
- Analyze fish community data with a focus on flow impacts

APPENDIX F

NOAA FISHERIES

FLOW RECOMMENDATION LETTER

JUNE 24, 2009

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

Southeast Regional Office
263 13th Avenue South
St. Petersburg, Florida 33701-5505
(727) 824-5317; FAX (727) 824-5300
http://sero.nmfs.noaa.gov/

June 24, 2009 F/SER4:PB/pw

(sent via electronic mail)

Colonel Edward J. Kertis
Commander, Savannah District
U.S. Army Corps of Engineers
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Attention: Jeffrey Morris

Dear Col. Kertis:

NOAA's National Marine Fisheries Service (NMFS) reviewed your letter, dated June 4, 2009, requesting information on the impacts to fishery resources and habitats from the reduced outflows from the J. Strom Thurmond (JST) Dam during the 2006-2009 drought of record in the Savannah River Basin.

During the drought, NMFS participated in frequent meetings with your staff, state and federal resource agencies, local governments, and non-governmental organizations concerning the water resource issues presented by the drought. Our concerns regarding potential effects of reduced water flows on marine and migratory diadromous fish were presented and discussed during the meetings.

Public trust resources potentially affected by altered Savannah River instream flow conditions include migratory diadromous species such as striped bass, American shad, blueback herring, Atlantic and shortnose sturgeon, and American eel. Shortnose sturgeon is listed as endangered under the Endangered Species Act and present in the Savannah River downstream of Augusta Diversion Dam and Savannah Bluff Lock & Dam as well as the Savannah River estuary. Riverine and estuarine habitats downstream from the JST Dam provide spawning and maturation habitat for those migratory species. Aquatic habitats and fishery resources of the Savannah River estuary are also potentially affected by altered JST outflow conditions, in combination with potential effects of the Savannah Harbor Expansion Project.

Attached is a summary of concerns and recommended studies we provided by email to Mr. Bill Bailey of your staff following the interagency meeting on May 11, 2009, at the Phinizy Swamp Nature Park Conference Center. That meeting provided for helpful interagency discussions of potential impacts from flow reductions and the information that would be within future assessments.

We hope this information is helpful. Related correspondence should be directed to the attention of Mr. Prescott Brownell at our Atlantic Branch office, 219 Fort Johnson Road, Charleston, South Carolina, 29412. He may be reached by telephone at (843) 953-7204, or by e-mail at Prescott.Brownell@noaa.gov. For information specific to the endangered shortnose sturgeon, correspondence should be directed to Dr.

Stephania Bolden, Protected Resources Division, at the letterhead address, by telephone at (727) 824-5312, or by e-mail at Stephania.Bolden@noaa.gov.

Sincerely,

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

CESAS, Jeffrey.S.Morris@usace.army.mil
CESAS, William.G.Bailey@usace.army.mil
FWS, Lora_Zimmerman@fws.gov
SCDHEC, TURNERLE@dhec.sc.gov
SCDNR, PerryB@dnr.sc.gov
flite@naturalsciencesacademy.org
F/SER3, Stephania.Bolden@noaa.gov

Response to COE: Savannah River: Low Flow/Drought
NOAA National Marine Fisheries Service
May 22, 2009

Unanticipated record drought conditions and critical water flow issues experienced in 1998-2009, particularly since 2005, have reduced reservoir storage capacity, and limited flexibility in regulating water flow in the Savannah River Basin. Strong concerns have been expressed by residents in the upper Savannah Basin regarding reduced water levels in the reservoirs, and potential effects on municipal water supply intakes, marina operations, and recreational water access.

A temporary reduction in the specified drought management plan occurred in early 2009; flow was reduced from 3,600 cfs to 3,100 cfs. It is anticipated that a flow reduction may again be requested by the U.S. Army Corps of Engineers (COE) in the future.

Reduction of minimum drought flows may affect both anadromous fish spawning and recruitment potential in the Savannah River. Species under NMFS stewardship that would likely be affected by reduced flow include American shad, blueback herring striped bass, Atlantic sturgeon, and shortnose sturgeon. The shortnose sturgeon is an endangered species listed under the Endangered Species Act (ESA); the Atlantic sturgeon is a candidate for listing. All of these fish are known to spawn in the early spring (February through March); therefore, any flow regime must be thoroughly analyzed to assess its effects on both spawning migration and habitat, particularly for the shortnose sturgeon pursuant to section 7 of the ESA.

Recently The Nature Conservancy (TNC) organized a meeting to discuss the biological and ecological flow requirements for the Savannah River during extreme low flow/drought conditions. Participants included TNC, NMFS, COE, USFWS, SCDNR, GADNR, GADDR, UGA, SCDHEC, and SCDNR. At the meeting conclusion, the COE requested that each agency submit a list of constraints, concerns and recommendations. The following is a summary from NMFS:

1. Constraint: shortnose sturgeon spawning period between February 1 and May. Shortnose sturgeon utilize the gravel bar just below New Savannah Bluff Lock and dam during the spawning season; all habitat upstream of this location is not accessible due to lack of fish passage. Assurances that any reduction in flow from the current flow regime of 3,600 cfs would not affect shortnose sturgeon or its limited spawning habitat.
2. Concerns:
    a. Little information exists on how flow rates impact the availability of spawning habitat in terms of water depth, substrate availability, migratory cues, larval dispersal, etc.
    b. Limited flow gauges on the river provide insufficient data to determine downstream effects of regulated flow.
    c. The guide curve regulating flow and reservoir depth in the upper Savannah River has greatly reduced the seasonal variability in water flow.
    d. The conservation level and full pool depths may not be appropriate and have not been recently analyzed and were designated about 50 years ago.

e. A deviation in flow from the 3,600 cfs to 3,100 cfs translates into 0.6 ft per month in reservoir elevation.

3. Recommendations:
   a. COE revisit the guide curve including the conservation depth and full pool levels.
   b. COE revisit the potential to provide fish passage appropriate for sturgeon around NSBLD.
   c. Assessment of the habitat at Augusta Shoals as potential spawning habitat for shortnose sturgeon.
   d. Analysis of hydrologic records (pre-dam) to identify periods of high flow and natural seasonal variability. Correlation of flow regimes to spawning periodicity of anadromous fish inhabiting the Savannah River and required cues; ensure appropriate flow/species (see Kynard 1997 for shortnose sturgeon).
   e. Assessment of habitat suitability/availability under different flow regimes.
   f. Assessment of flow regimes on sediment distribution and re-suspension, especially relative to shortnose sturgeon spawning habitat.
   g. A technical (site specific) instream flow assessment to provide an adequate basis for evaluation of potential effects on sturgeon and other anadromous species spawning habitats. Details are provided in Appendix A. (Attached).

Appendix A. Instream Flow Study

Prior ecological instream flow studies on the upper Savannah were not designed to assess extreme drought flow conditions in the Thurmond and Stevens Creek tailwater reaches, the Augusta Shoals, the riverine habitat reach below Savannah Bluff Lock & Dam, and the lower Savannah River.

An instream flow would provide a sound technical basis for evaluation of alterative drought flows, and potential effects on aquatic species, important habitats and water quality. Site-specific studies may be focused on specific reaches where prior studies did not fully address the potential effects of extreme drought flows on important species life cycle needs.

The study approach should include the following key study elements:

- Establish an interagency instream flow study team
- Review prior instream flow studies conducted in the upper Savannah River
- Determine the appropriate study area(s) where additional assessment is needed
- Identify key aquatic species or guilds potentially affected
- Identify key habitat suitability criteria for each species
- Select instream flow study methodologies (IHA + species/habitat field study)
- Develop draft and final study plans

Key evaluation species to be considered

- Shortnose sturgeon
- Atlantic sturgeon
- American shad, hickory shad, river herring
- Striped bass (Inland spawning stock model)

Key habitat considerations to be evaluated:

- Anadromous species spawning habitats, maturation habitats (areal extent, suitability, accessibility)
- Effects of flows on fish movements to and from spawning habitats
- Effects of flows on fish passage and facility operations (existing and planned)

Instream flow methodologies to consider

- IFIM/PHABSIM
- HEC-EFM
- MESOHABSIM (may be best suited for sturgeon habitat characterization and assessment of instream flows)
- IHA (In combination with a technical instream flow assessment)

APPENDIX G

GEORGIA

DEPARTMENT OF NATURAL RESOURCES

ENVIRONMENTAL PROTECTION DIVISION

SUMMARY OF FINDINGS ON

2008

3,100 CFS DISCHARGE

JUNE 22, 2009

Proposed Changes to Lake Thurmond Releases to Mitigate Drought Impacts

During the ongoing drought in the southeastern U.S., the Savannah River reservoir system operated by the Army Corps of Engineers (ACE) experienced extreme pressure and difficulties. In the summer of 2008, based on the Information Paper provided by the Army Corps of Engineers (Corps) and information compiled by other cooperating institutions, Georgia EPD, in coordination with South Carolina Department of Health and Environmental Control (SCDHEC) and South Carolina Department of Natural Resources (SCDNR), conducted a thorough analysis of potential operations of the system under a variety of hydrologic conditions. At that time, Georgia EPD, SCDHEC, and SCDNR propose that the operation (i.e. a Thurmond release of 3,600 cfs) be revised to maintain a 3,600 cfs release from Thurmond Dam in the warmer months of March through September and reducing the release to 3,100 cfs in the cooler months of October to February. The analysis indicated that this reduction would stabilize the system and substantially reduce the speed of decline in system storage. In addition, the analysis showed that the water users along the river would not be impacted as a result of this revised operation and modeling and field observations indicated that it was unlikely that water quality would be of a concern. The Army Corps of Engineers implemented the reduced flow from Thurmond Dam to 3,100 cfs from November 2008 through January 2009. The period of reduced releases was shortened due to shortnosed sturgeon spawning.

It was suggested several real time monitoring stations be examined to reviewed changes in flow, dissolved oxygen concentrations, and conductivity measurements in the lower reaches of the Savannah River as a result of the reduced releases from Thurmond Dam. It was suggested that adaptive management be used as part of the Corps' operation. If field observation indicate any problem with DO concentration and conductivity levels, then prompt actions can be taken to mitigate the adverse conditions.

The following table lists those parties that were responsible for reporting on specific environmental targets. Upon review of that information, and discussion with SCDHEC and SCDNR, decisions were to be made on notifying the ACE of appropriate adjustments to Thurmond release levels. No problems will targets were ever reported.

Location	**Target**	**Responsible Party**
Shoals	Flow 1500 cfs	City Of Augusta

USGS 021989773	DO 5.0 mg/L daily average DO 4.0 mg/L instantaneous Temperature ≤ 90 ºF pH 6-8.5	GAEPD
USGS 02198840	Conductivity 10,000 µS/cm	GA EPD
Abercorn Creek	Chloride 16 ppm	City of Savannah
USGS 02198500	Flow < 4,500 cfs	SC DHEC
Various	Water level at the intakes	Intake operators
Various	Sturgeon migration	SC DNR

A plot of the flow measured in the Savannah River near Clyo, Georgia that includes the period of reduced releases from Thurmond is shown in Figure 1.

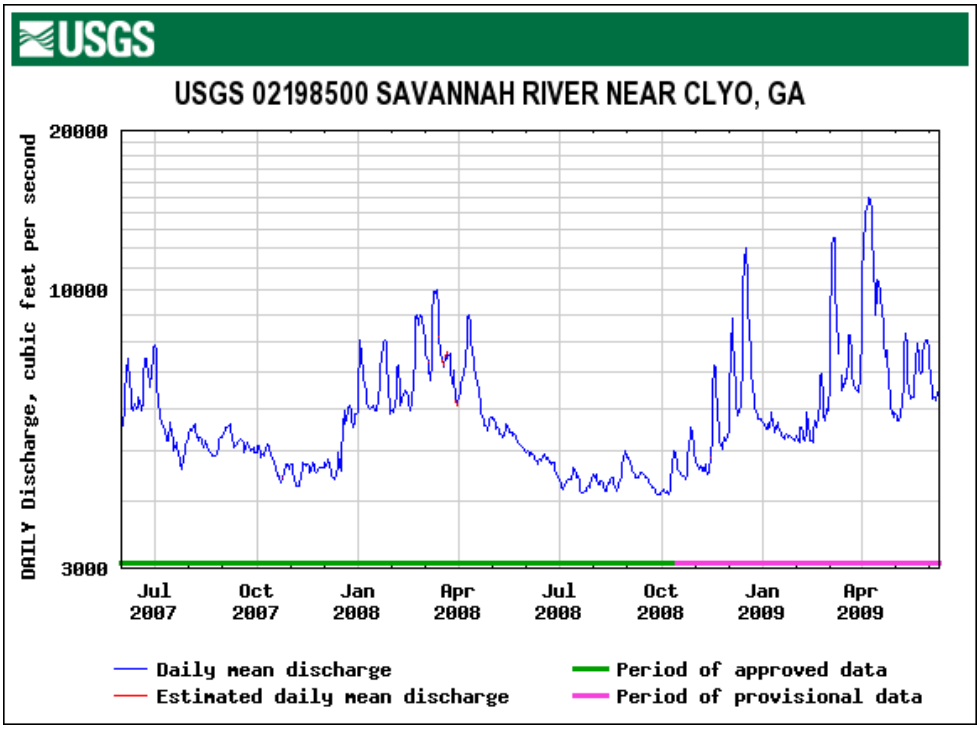


Figure 1. Flow at Savannah River Flow near Clyo, Georgia

A plot of the conductivity measured in the Savannah River near Port Wentworth, Georgia that includes the period of reduced releases from Thurmond is shown in Figure 2.

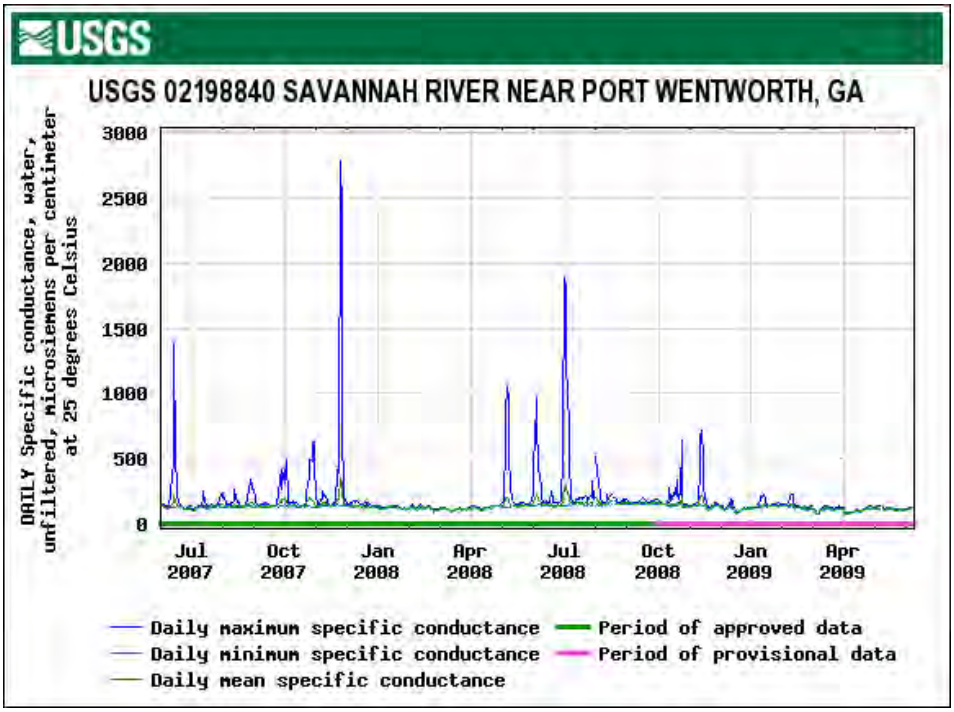


Figure 2. Conductivity in Savannah River near Port Wentworth, Georgia

A plot of the dissolved oxygen measured in the Savannah Harbor at the Corps Dock that includes the period of reduced releases from Thurmond is shown in Figure 3.

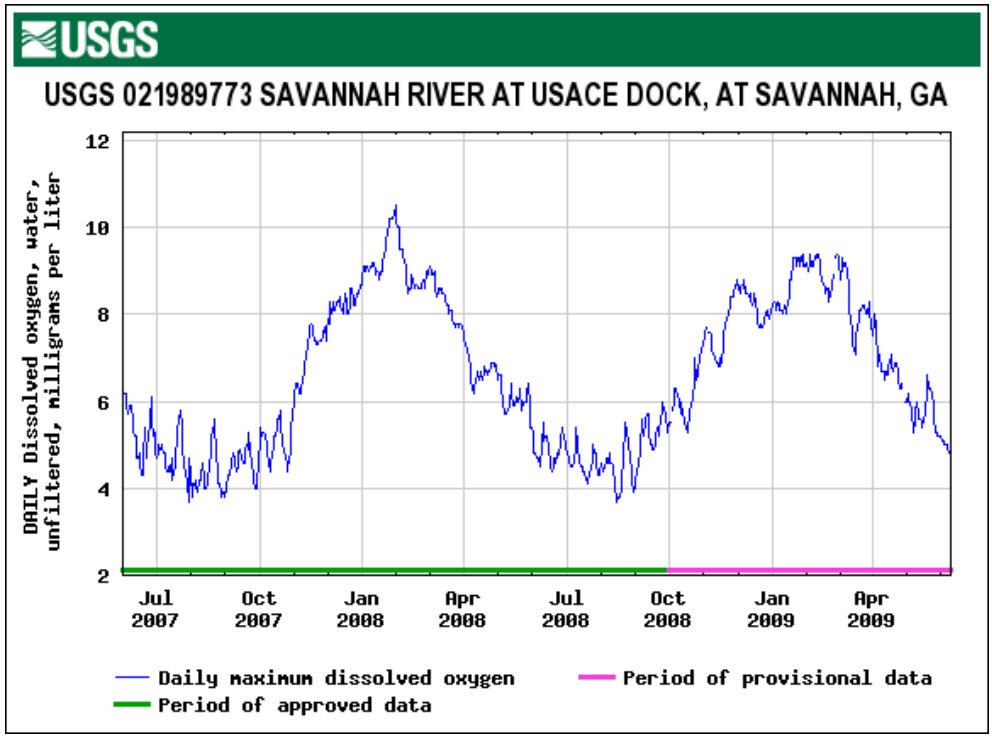


Figure 3. Dissolved Oxygen Savannah River at the Corps Dock

All three of these plots indicate that there was no problem with water quality in the Savannah River system due to the reduced releases from Thurmond. In fact, the period that the releases are reduced could be extended using an adaptive management approach. There could be reduced releases from Thurmond Dam during period when the dissolved oxygen concentration in the Savannah Harbor is greater than 5.0 mg/L and the gage at the Corps Dock could be used to determine this period. Thurmond Dam releases could be increased during fish spawning (i.e., February – March for shortnosed sturgeon, May robust redhorse), but reduced once fishing spawning is over if the dissolved oxygen levels in the Harbor are sufficient (i.e., >5.0 mg/L).

APPENDIX H

RECOMMENDATIONS

FROM

2003 ECOSYSTEM FLOW WORKSHOP

FOR

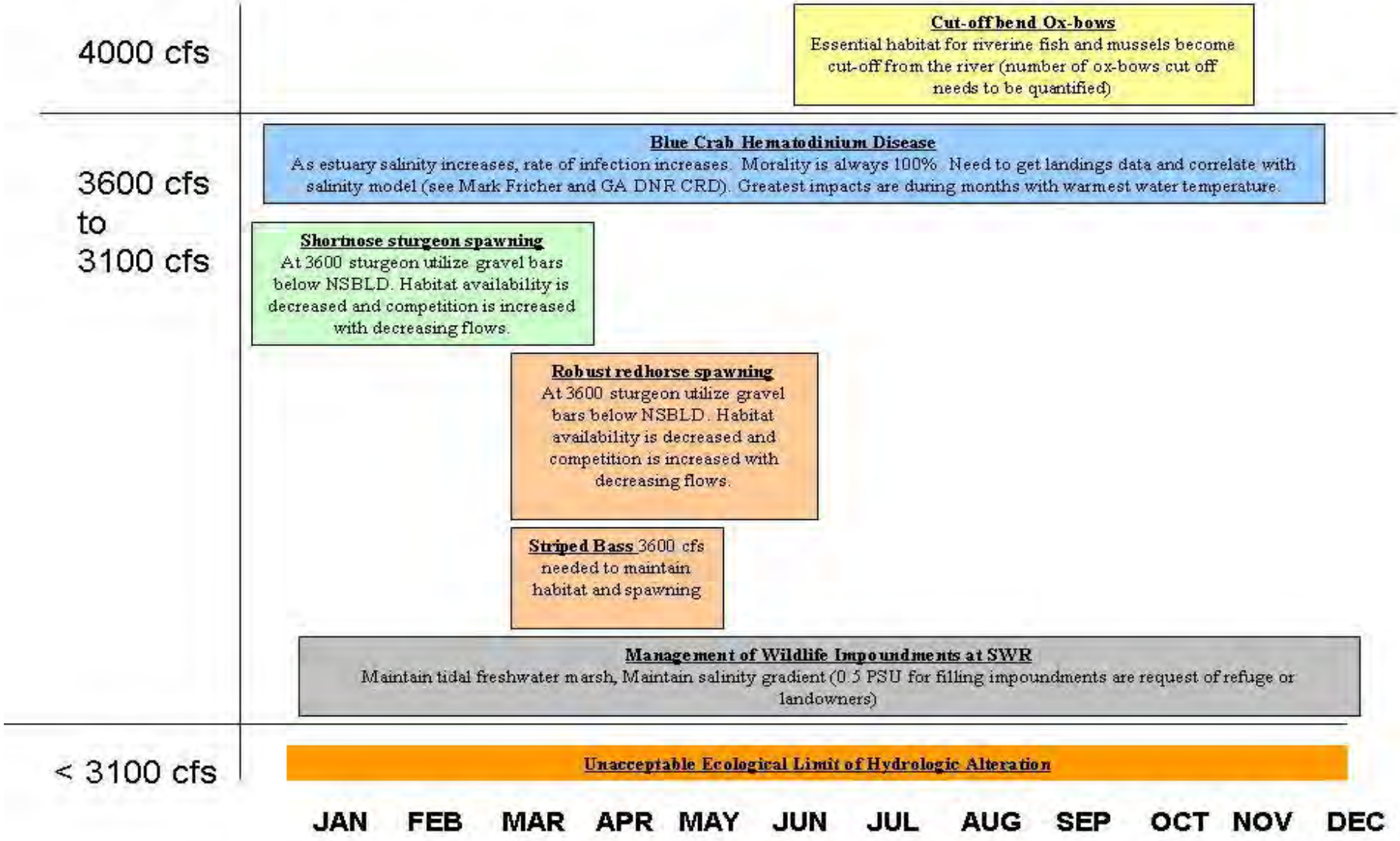
SAVANNAH RIVER

DOWNSTREAM OF

THURMOND DAM

Ecosystem Flow Recommendations

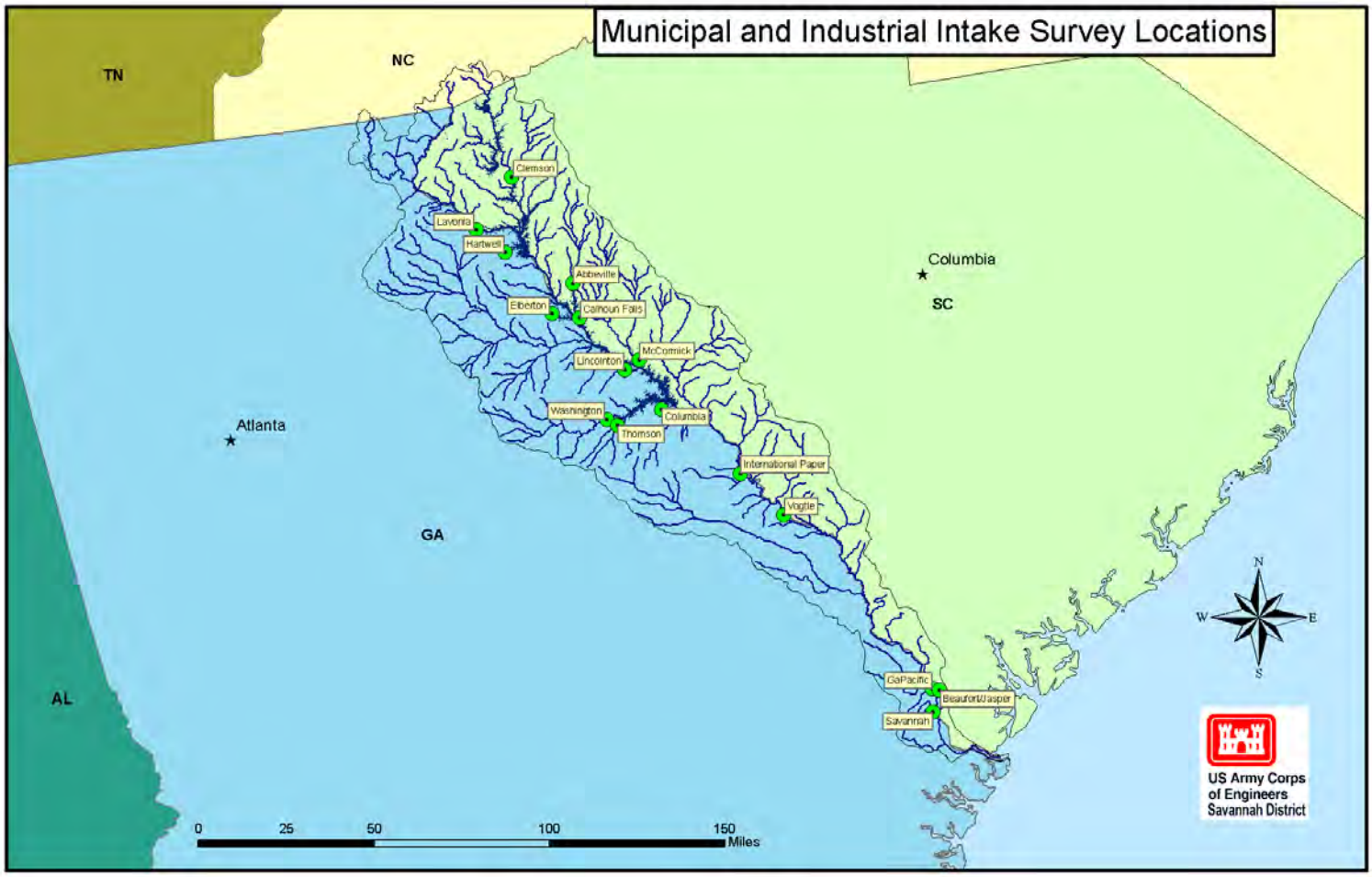
Savannah River, below Thurmond Dam (Extreme Low Flows)



APPENDIX I

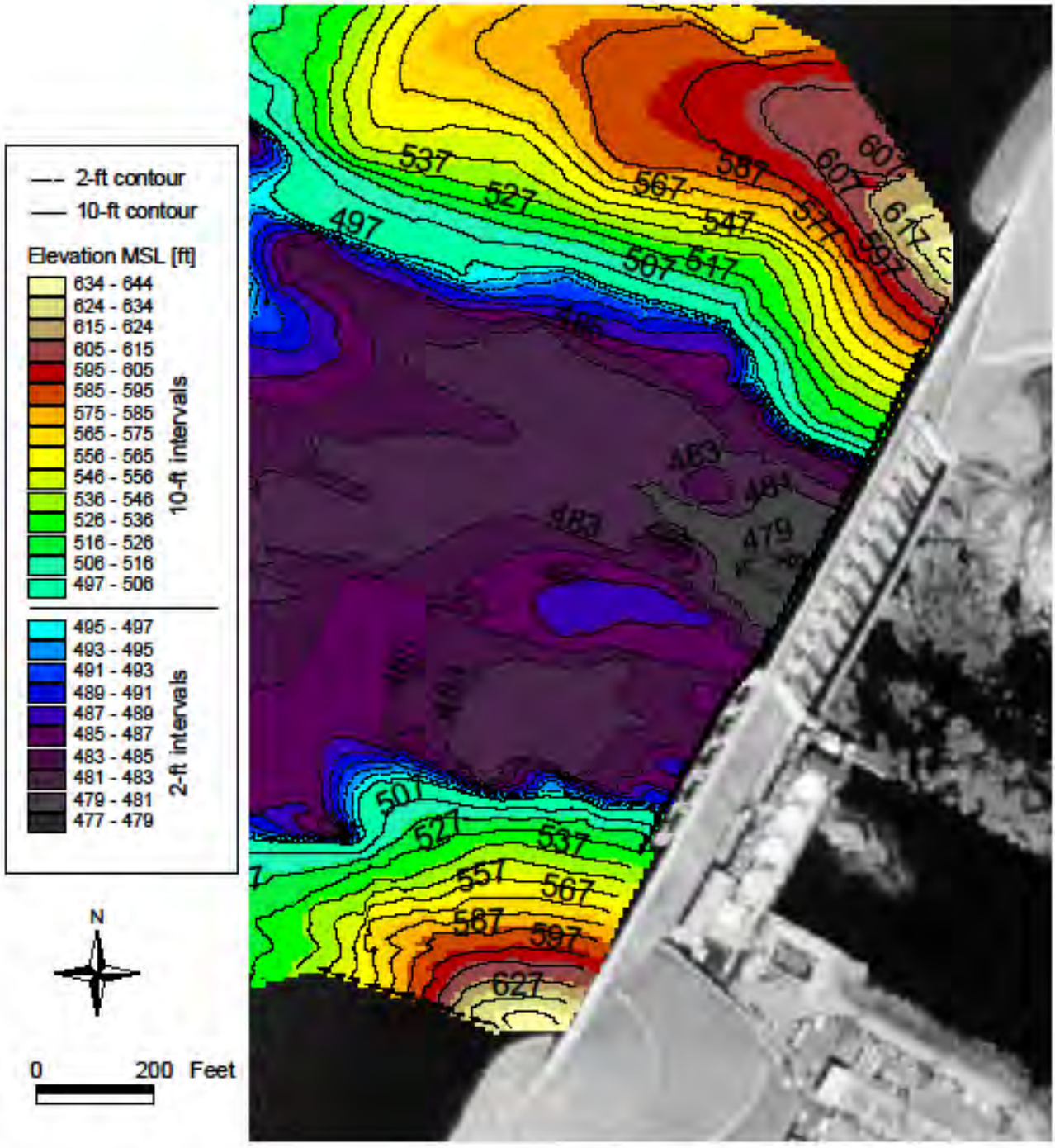
BATHYMETRIC SURVEY OF

INTAKE LOCATIONS

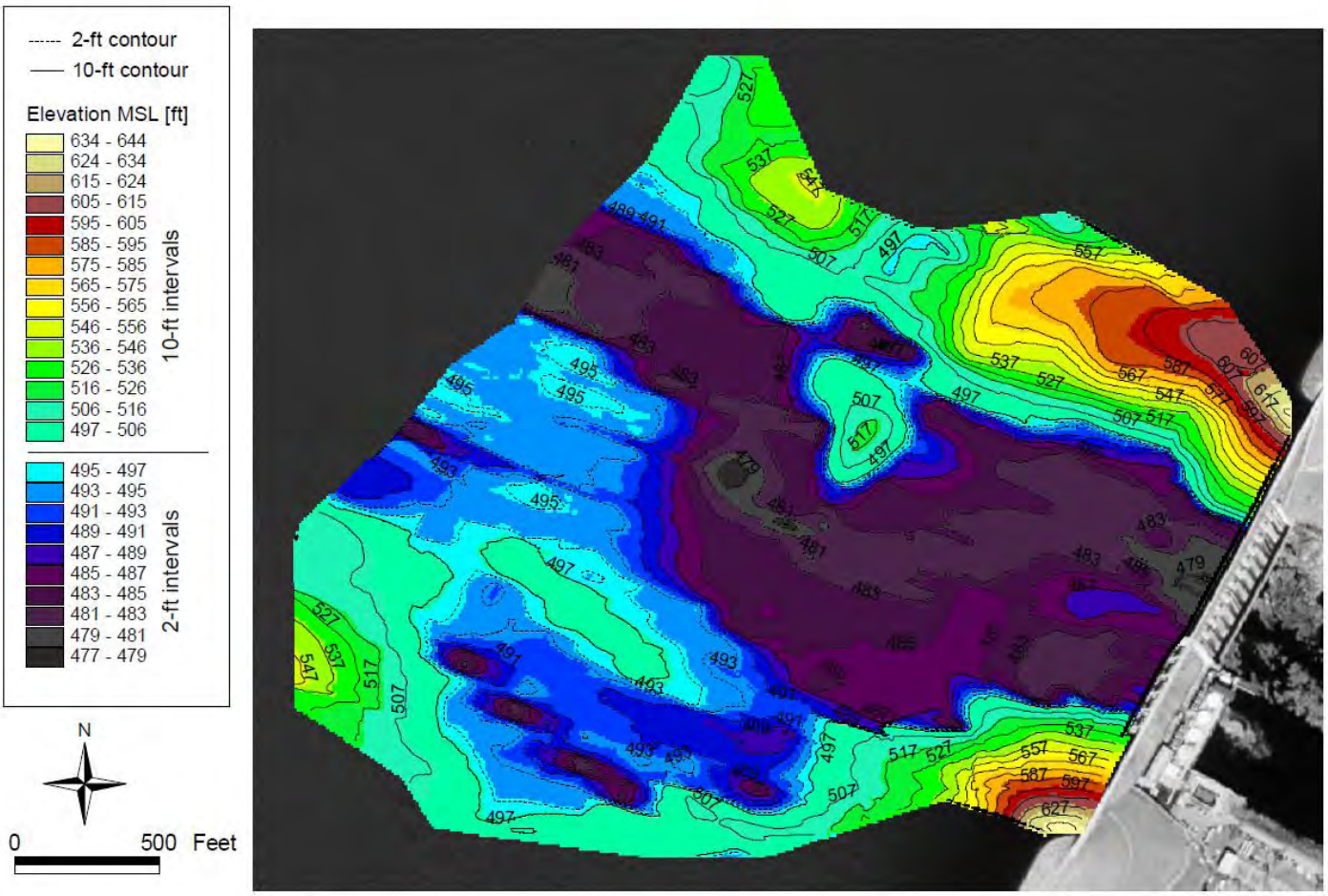

Municipal and Industrial Intake Survey Locations
TN
NC
SC
GA
AL
Columbia
Atlanta
Clemson
Lavonia
Hartwell
Abbeville
Elberton
Calhoun Falls
McCormick
Lincolnton
Washington
Columbia
Thomson
International Paper
Vogtle
GaPacific
Beaufort/Jasper
Savannah
N
W
E
S
0
25
50
100
150
Miles
US Army Corps
of Engineers
Savannah District

Hartwell Forebay Bathymetry (4/8/2009)

(dam area enlarged)

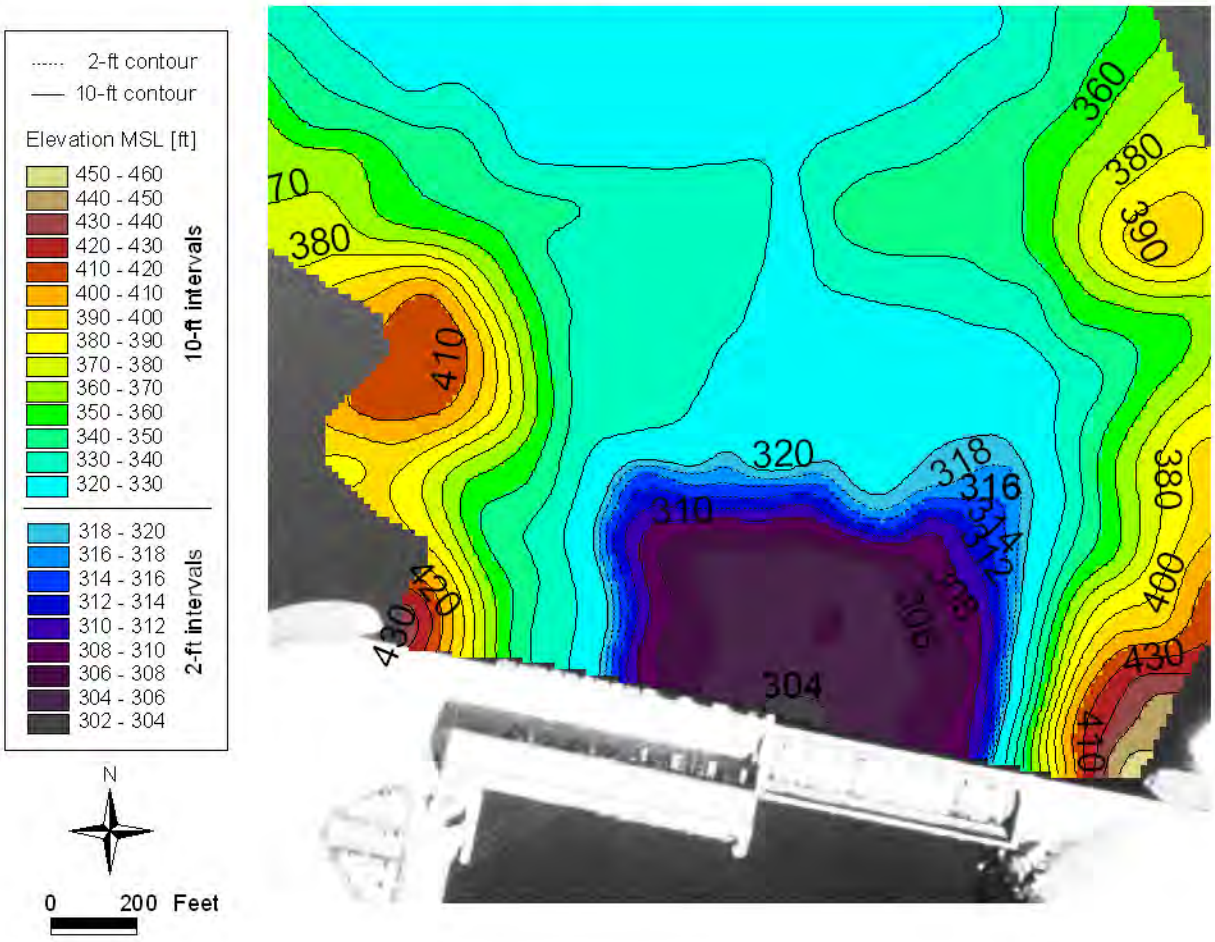


Hartwell Forebay Bathymetry (4/8/2009)

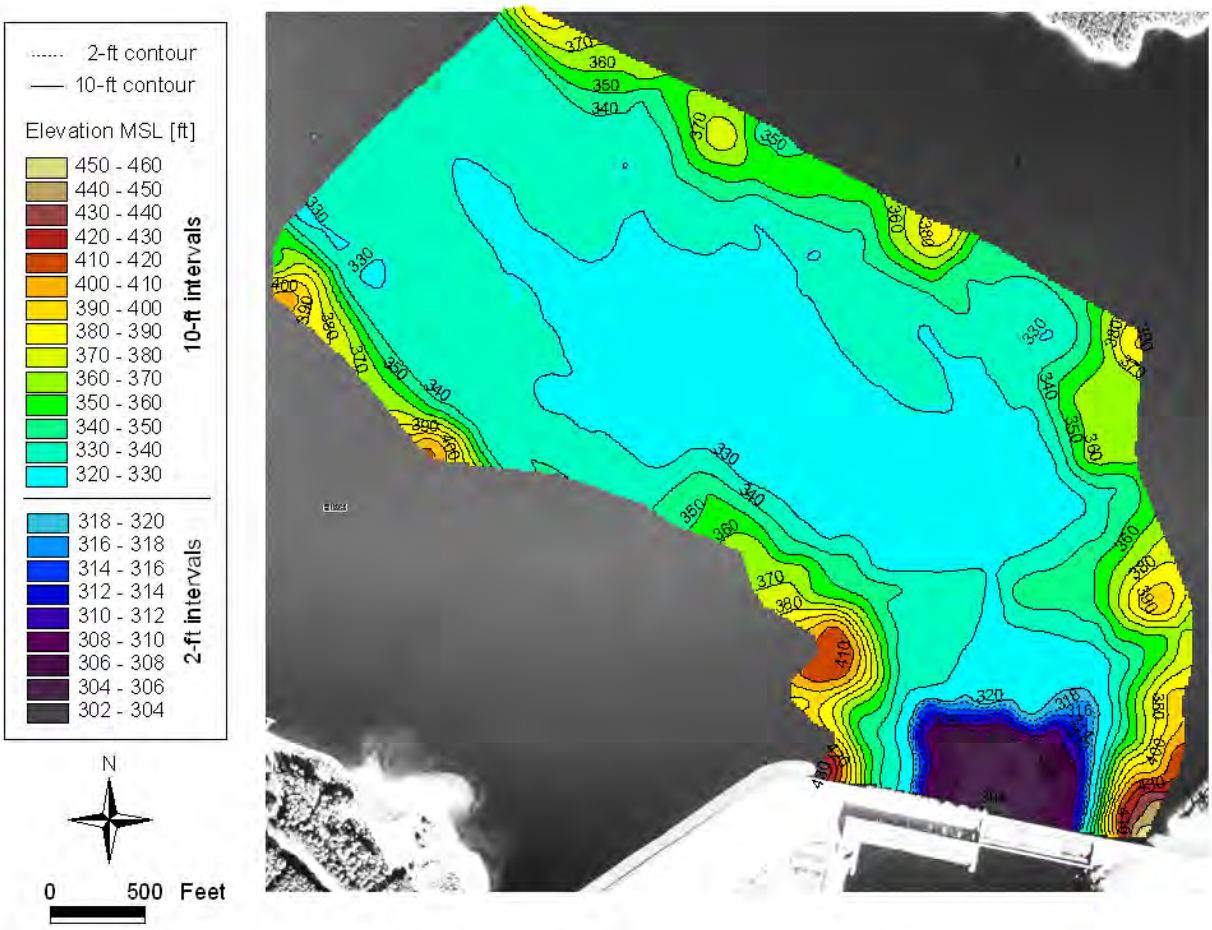


RBR Forebay Bathymetry (12/16/2008)

(dam area enlarged)

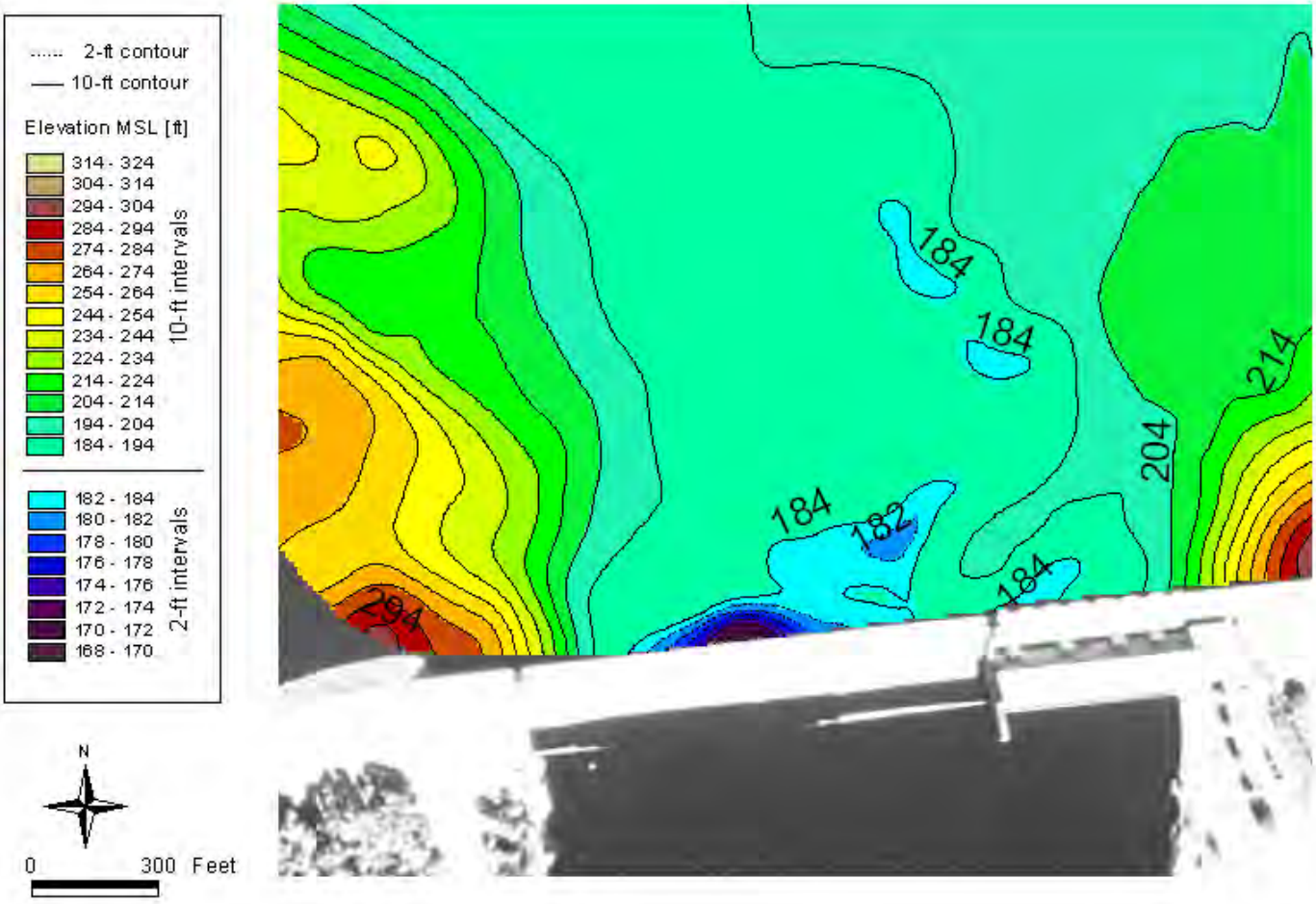


RBR Forebay Bathymetry (12/16/2008)

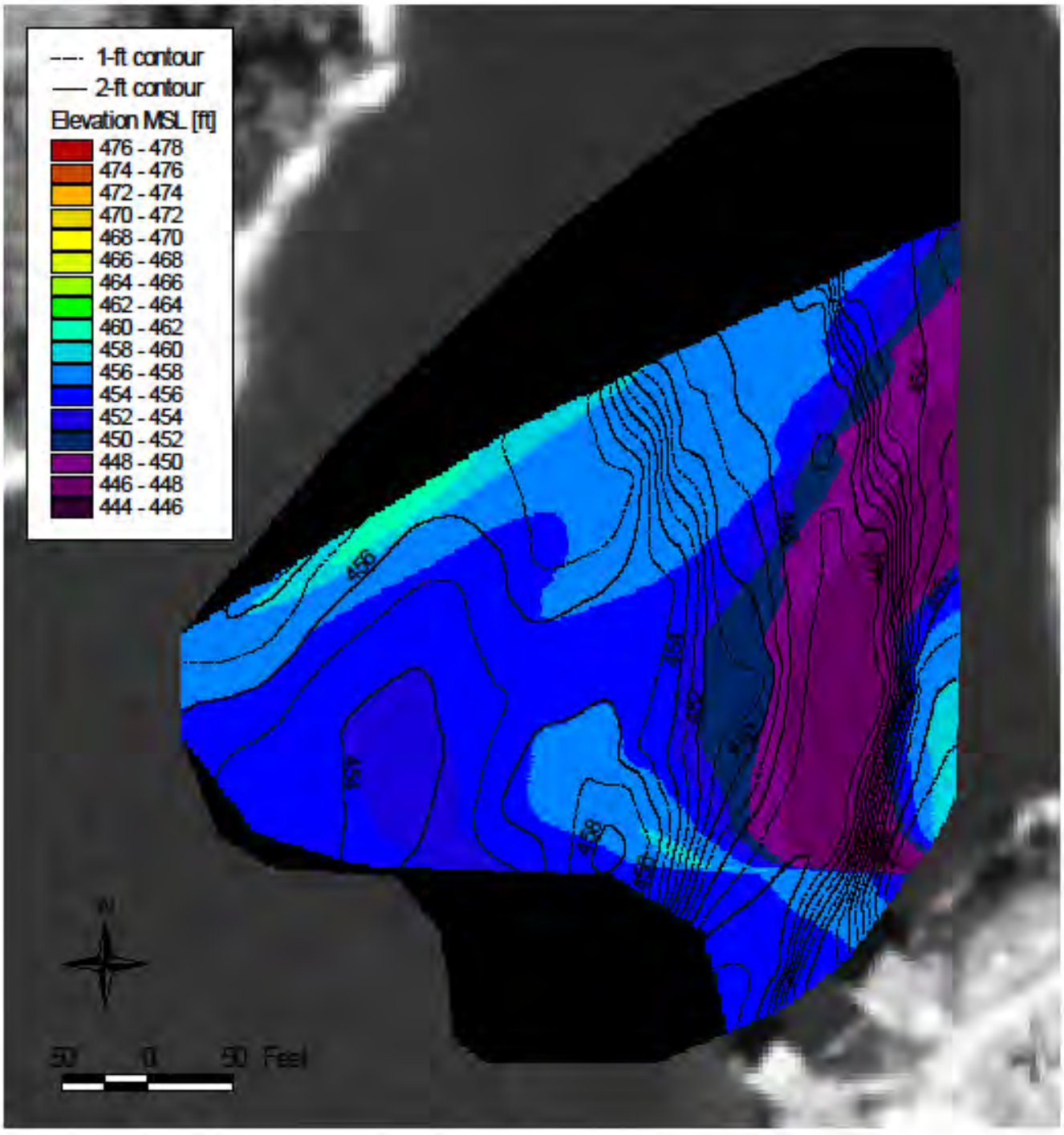


JST Forebay Bathymetry (4/27/2009)

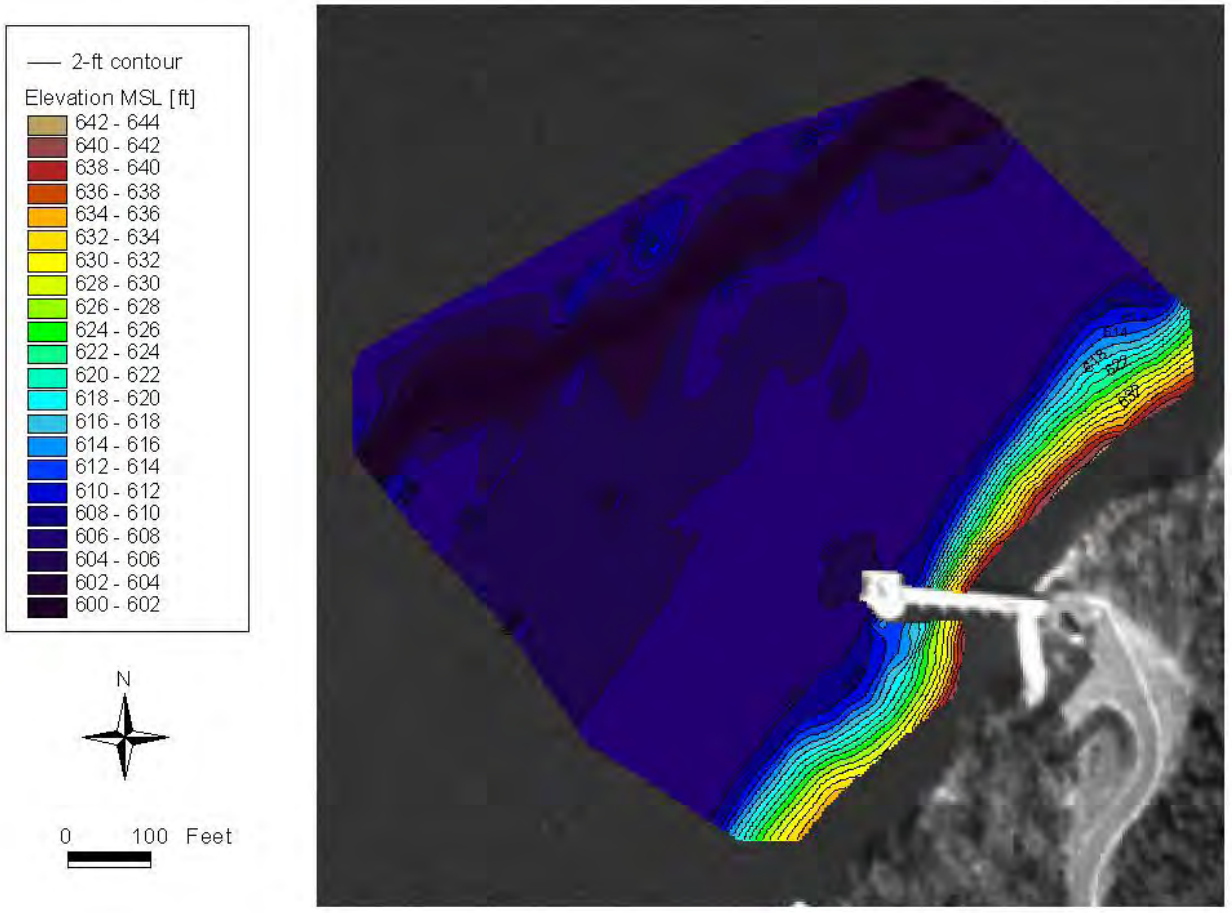
(dam area enlarged)



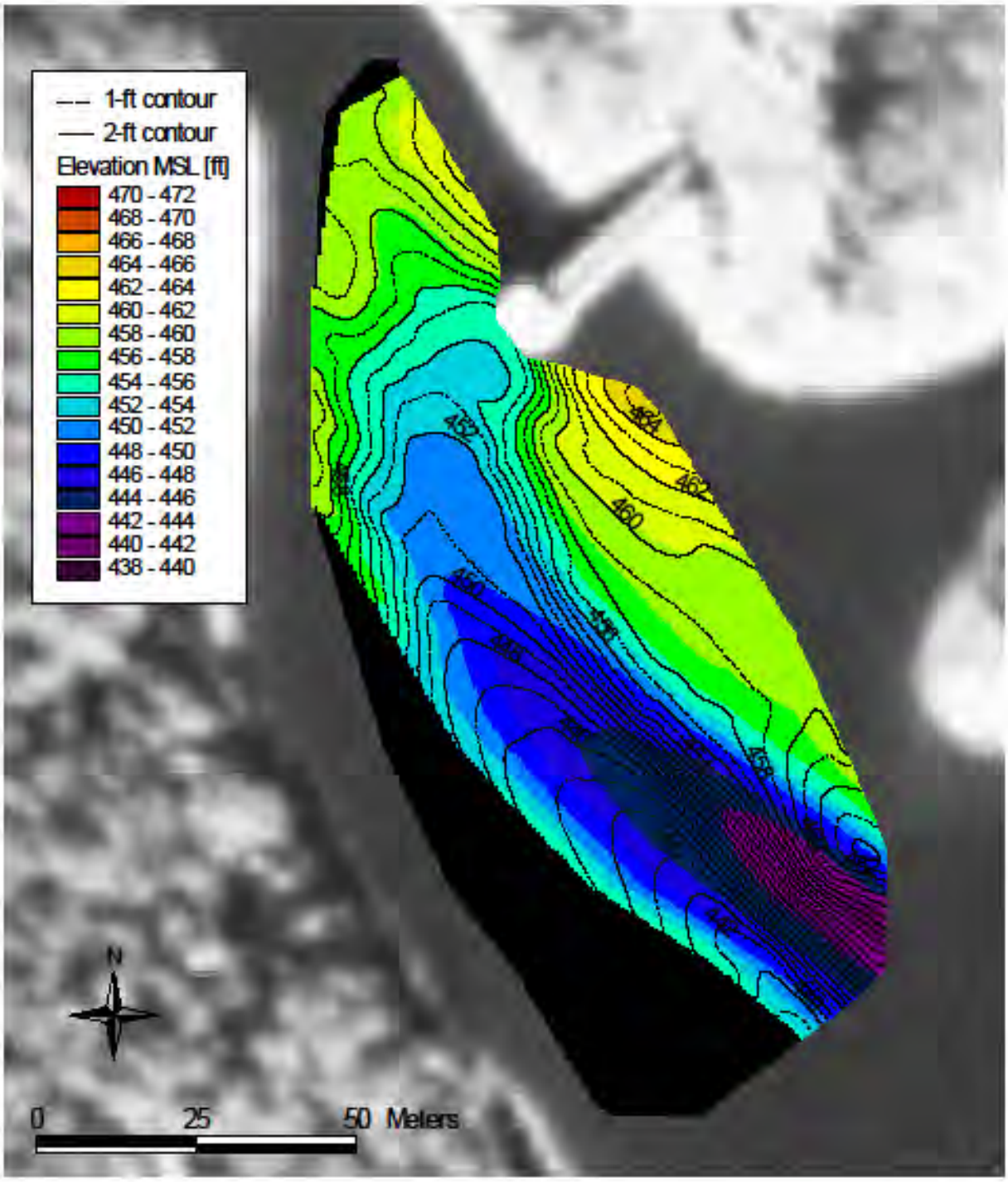
Abbeville Bathymetry (12/16/2008)



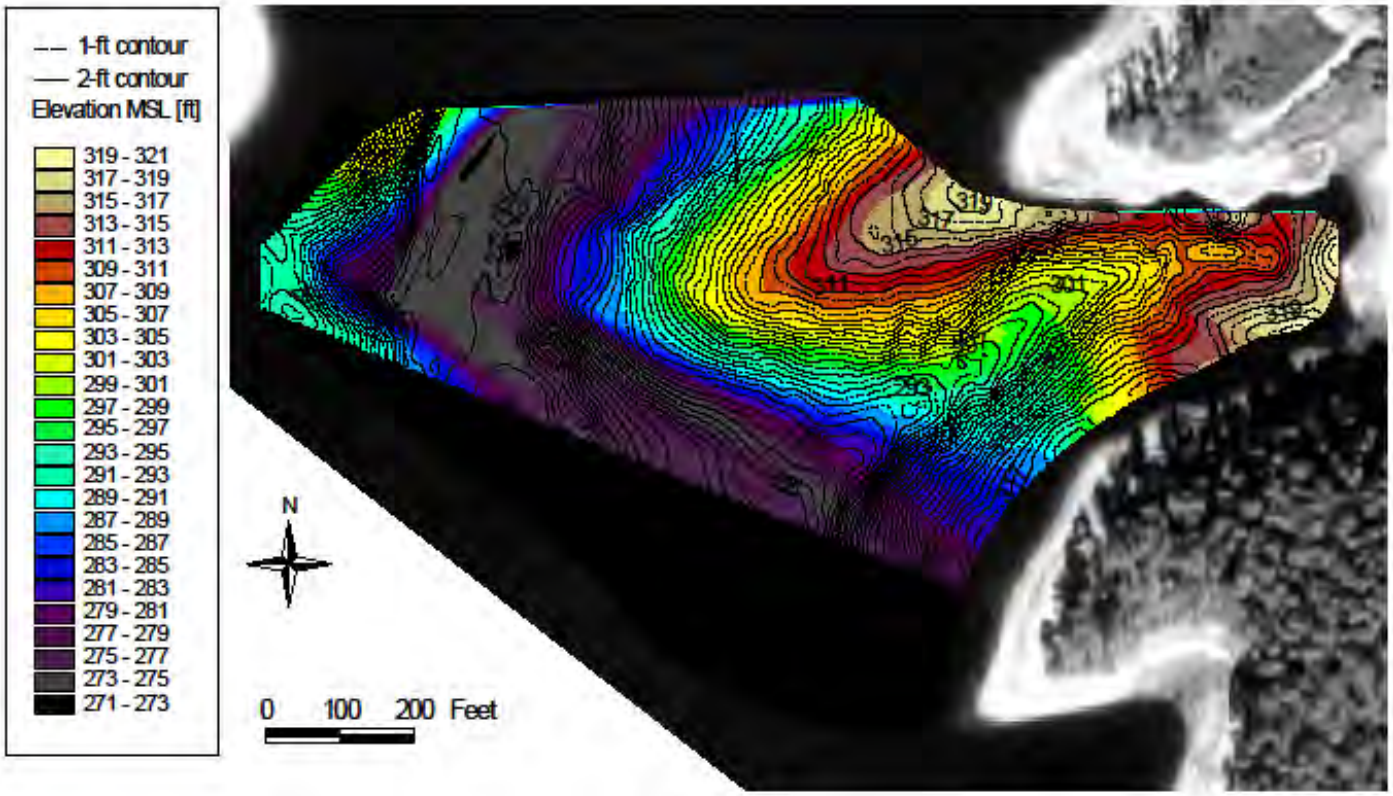
Anderson Bathymetry (4/21/2009)



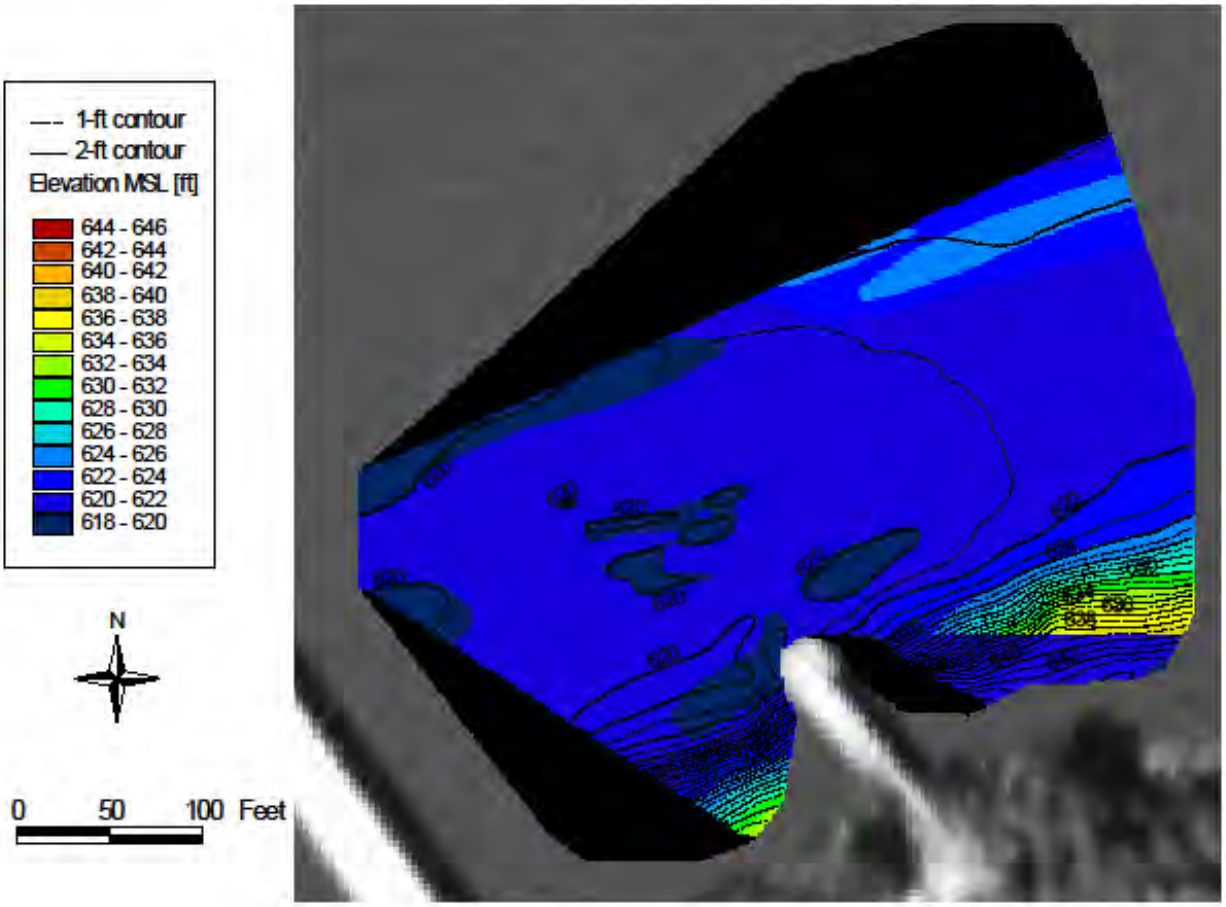
Calhoun Bathymetry (12/16/2008)



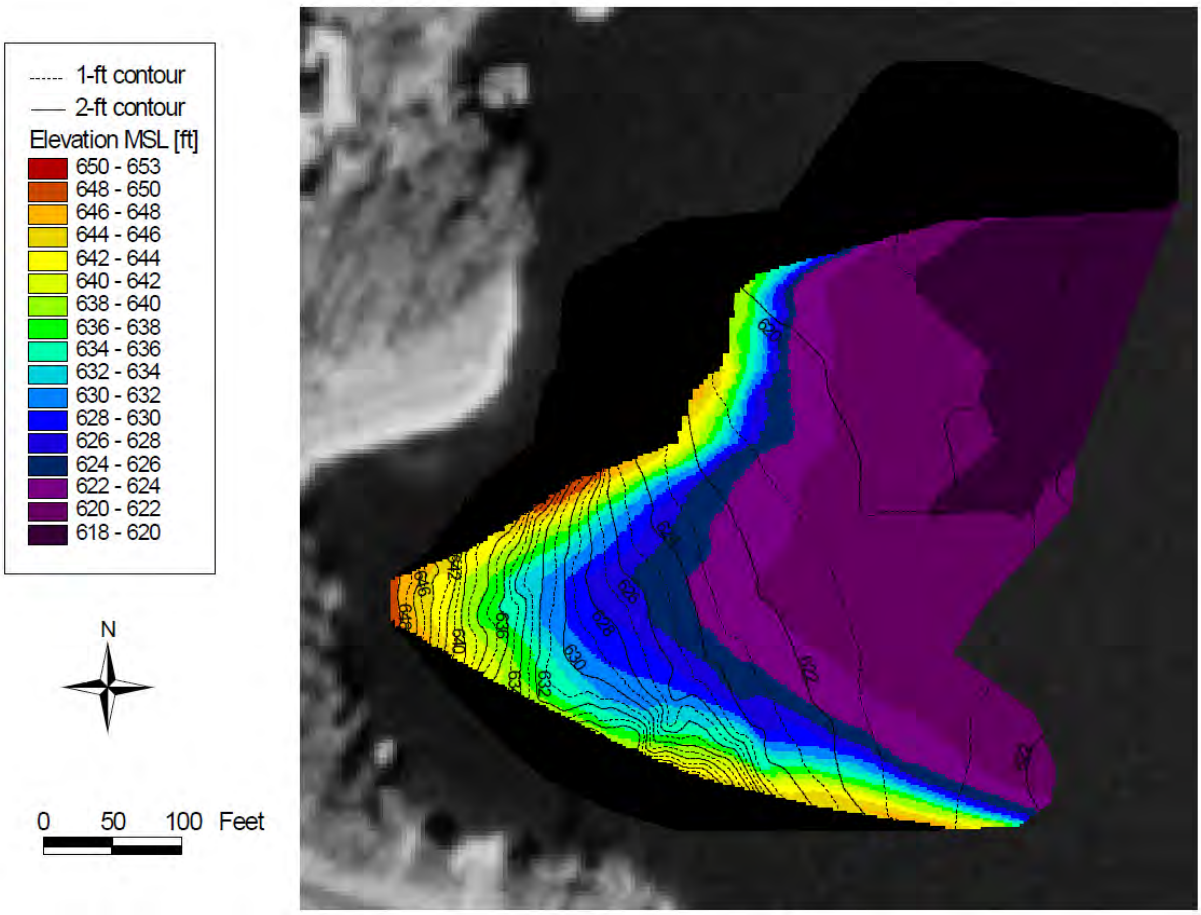
Columbia Bathymetry (4/27/2009)



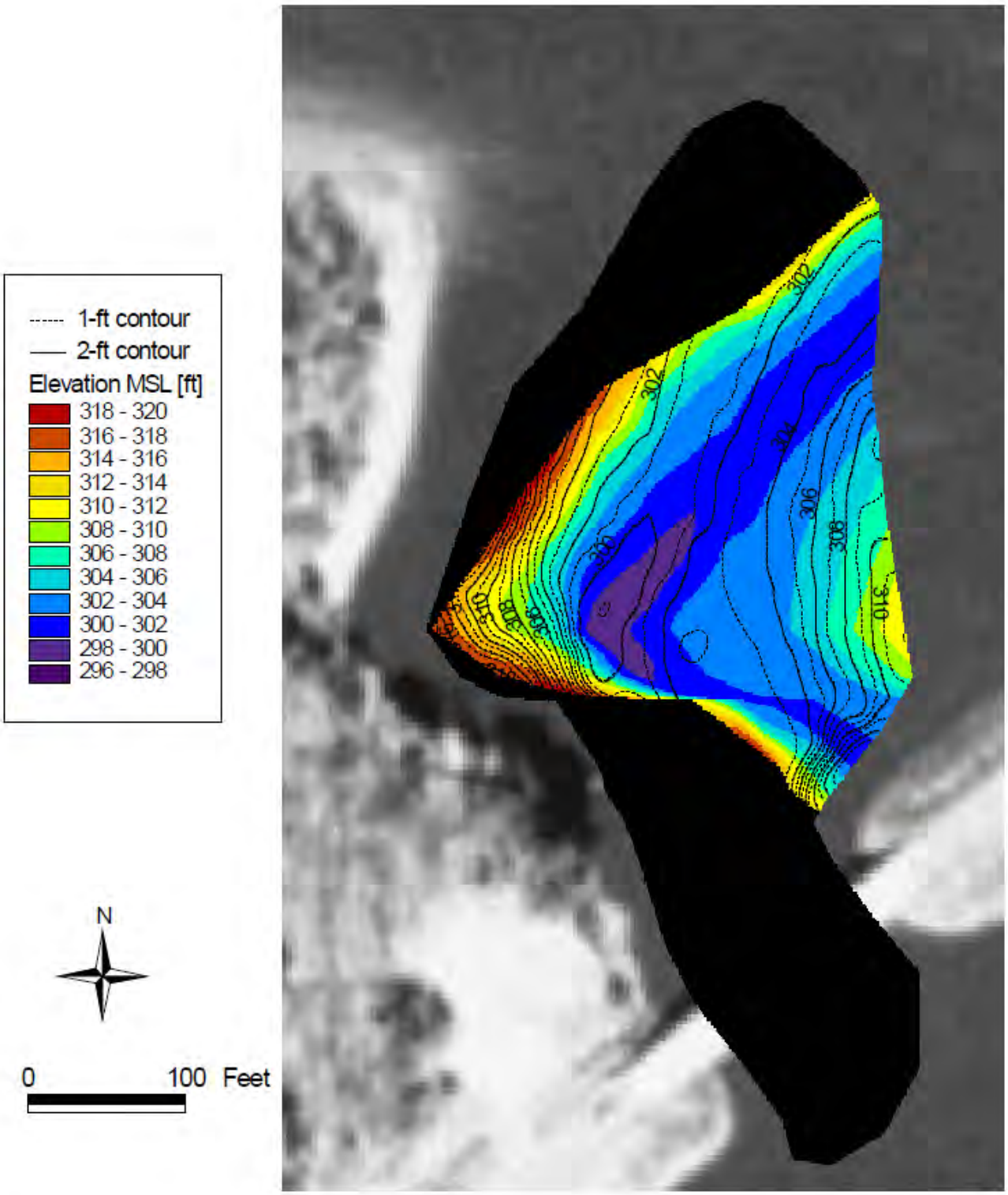
Clemson Bathymetry (4/8/2009)



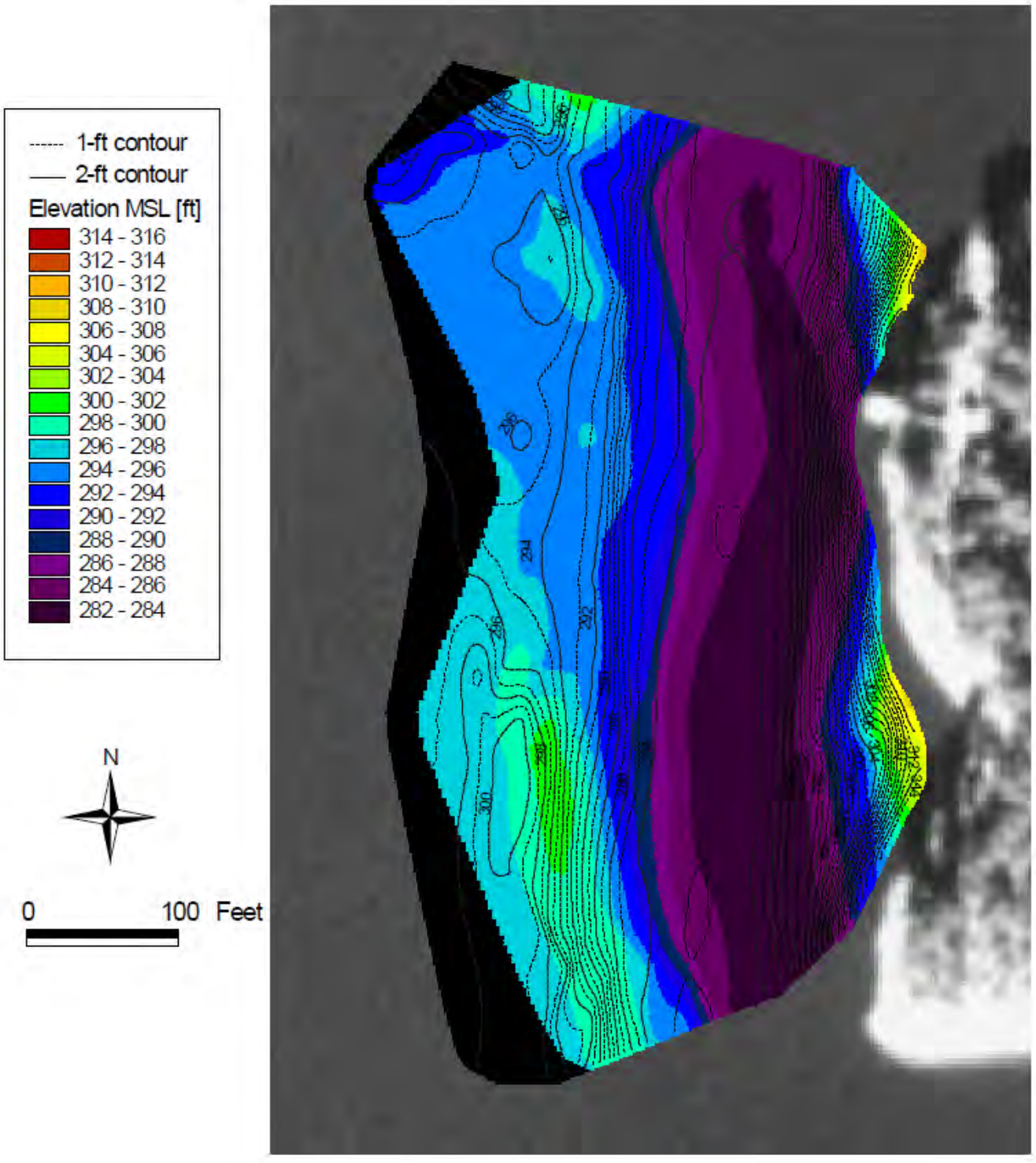
Lavonia Bathymetry (4/21/2009)



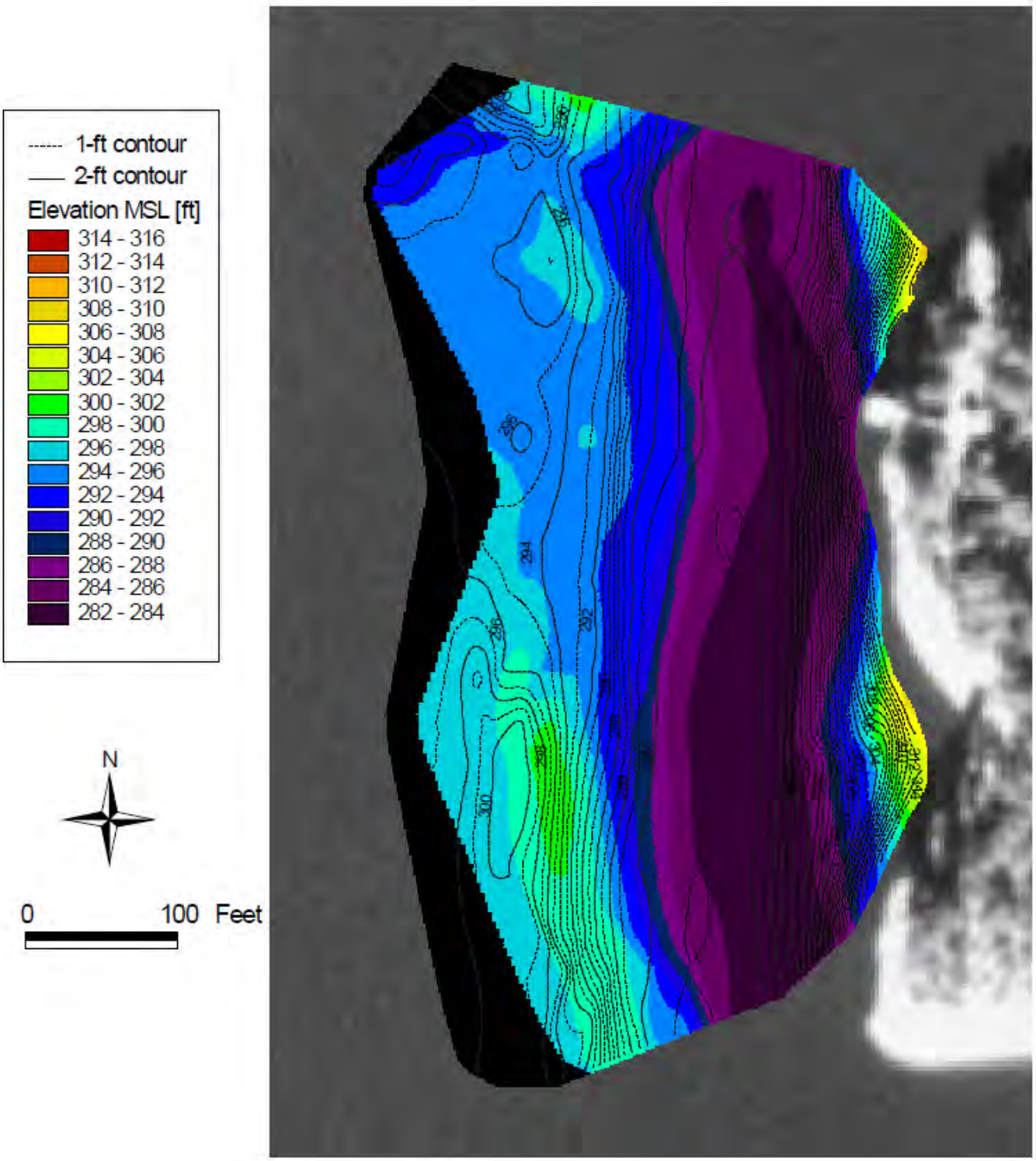
Lincolnton Bathymetry (4/16/2009)



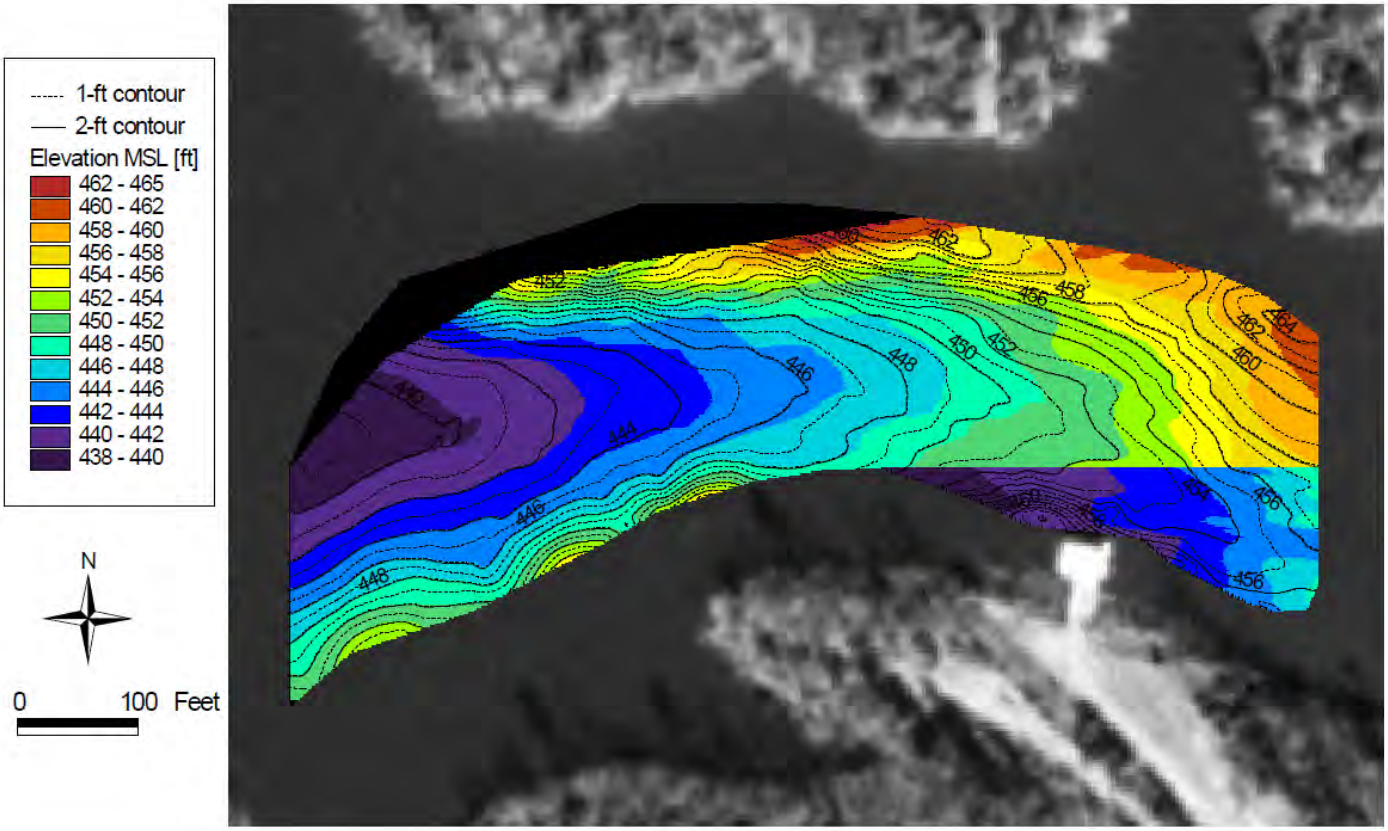
McCormick Bathymetry (4/16/2009)



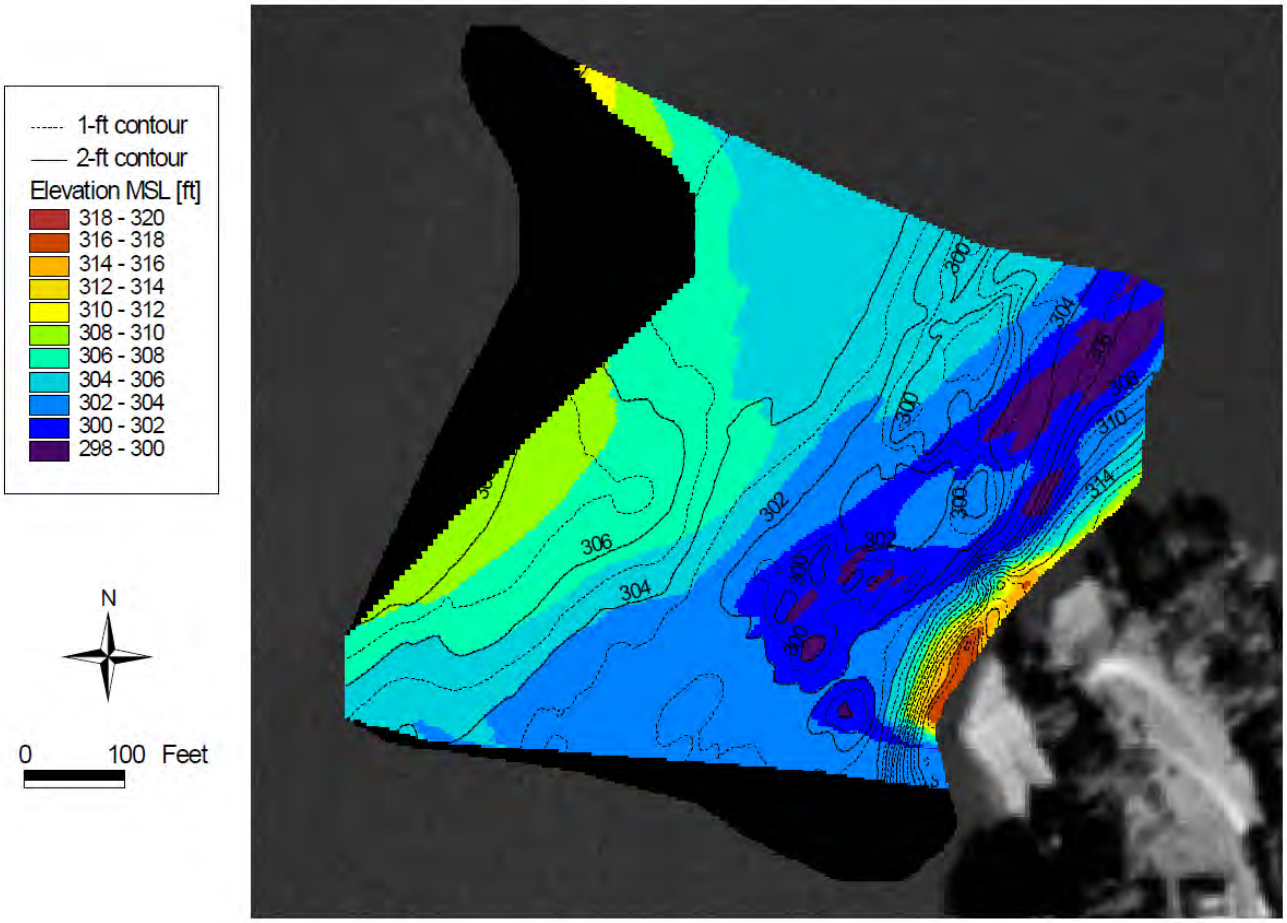
McCormick Bathymetry (4/16/2009)



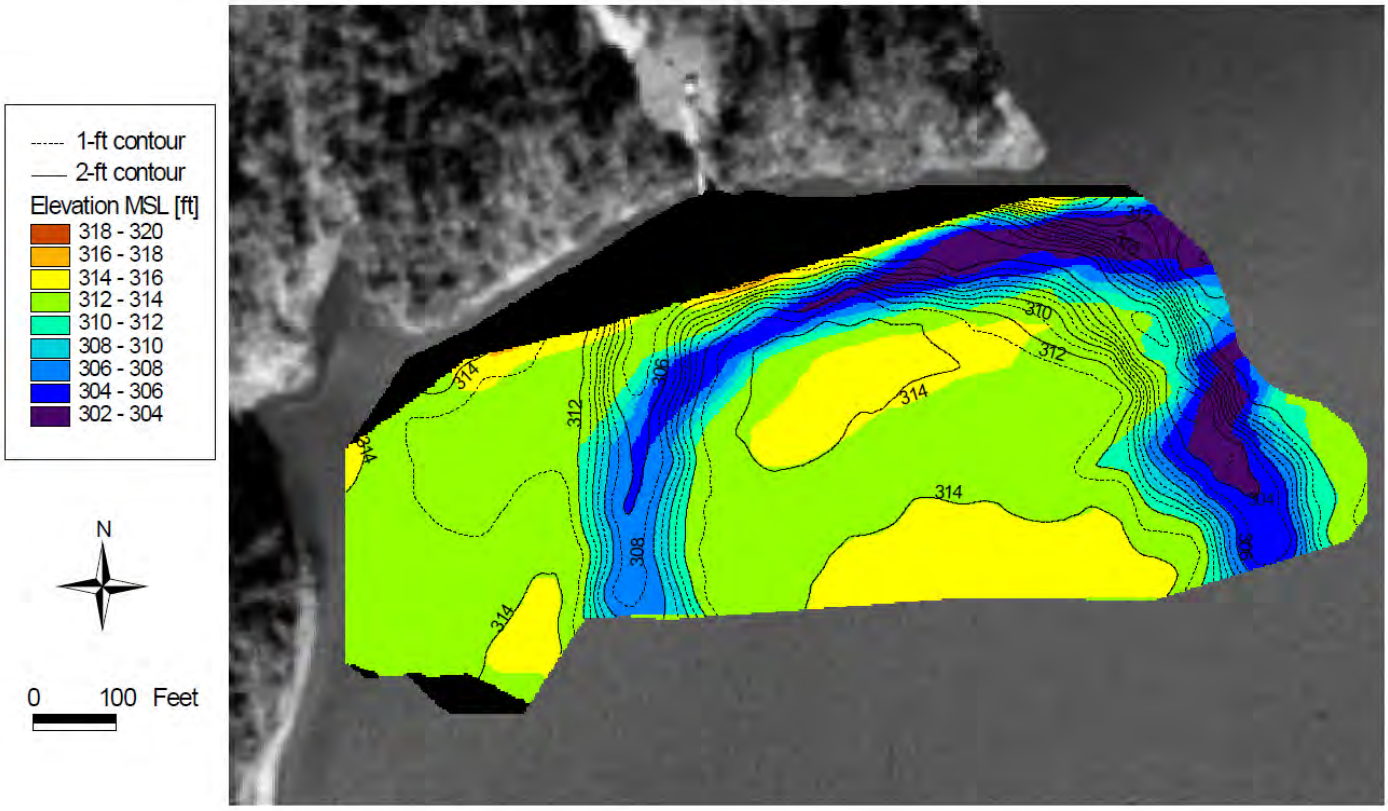
Mohawk Bathymetry (12/16/2008)



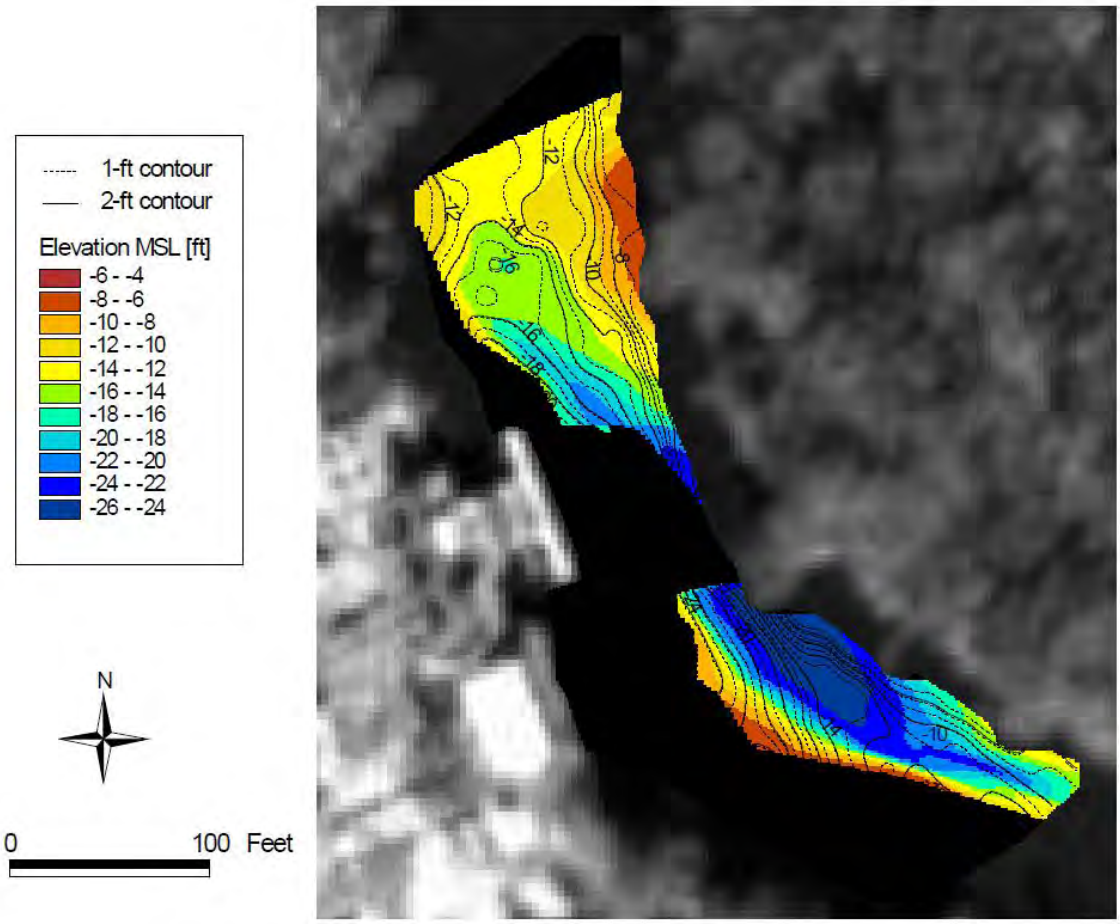
Thomson Bathymetry (4/22/2009)



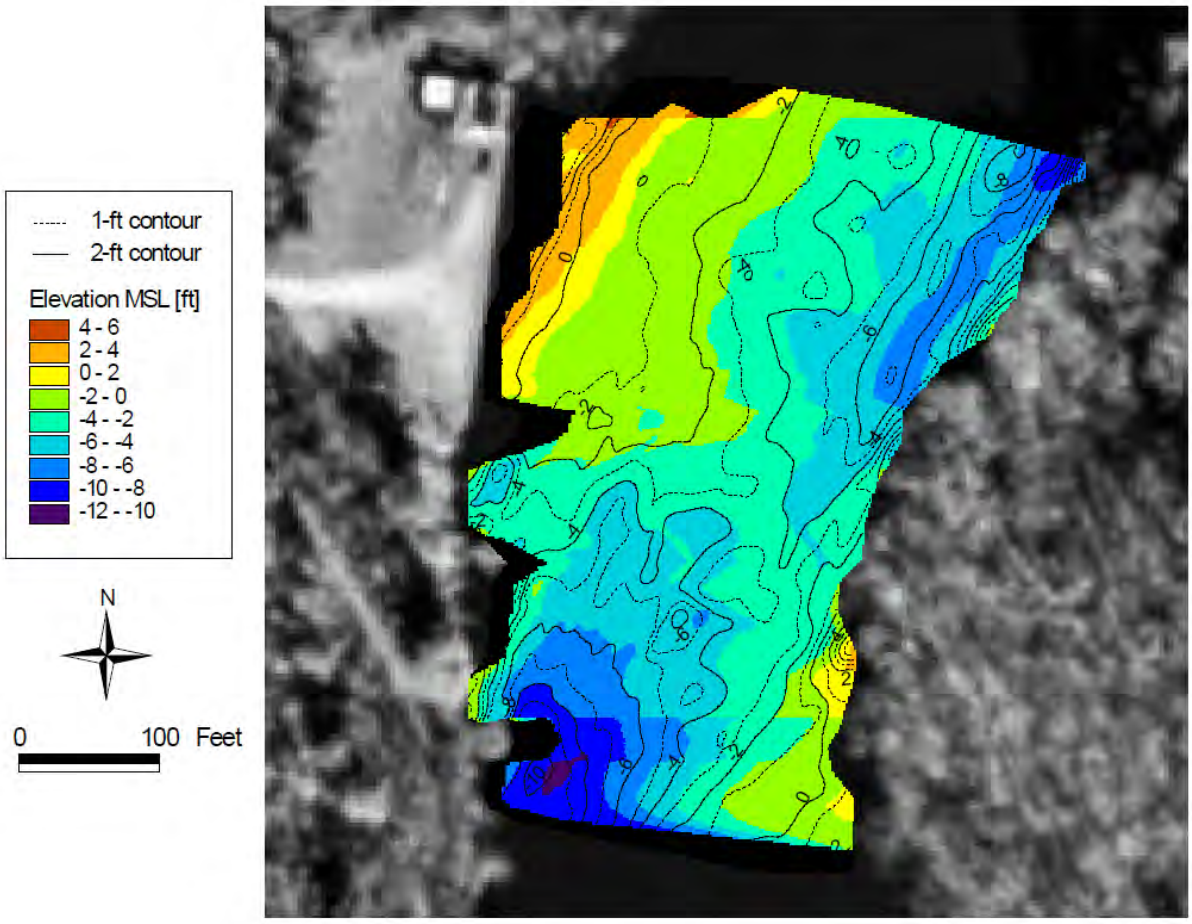
Washington Bathymetry (4/22/2009)



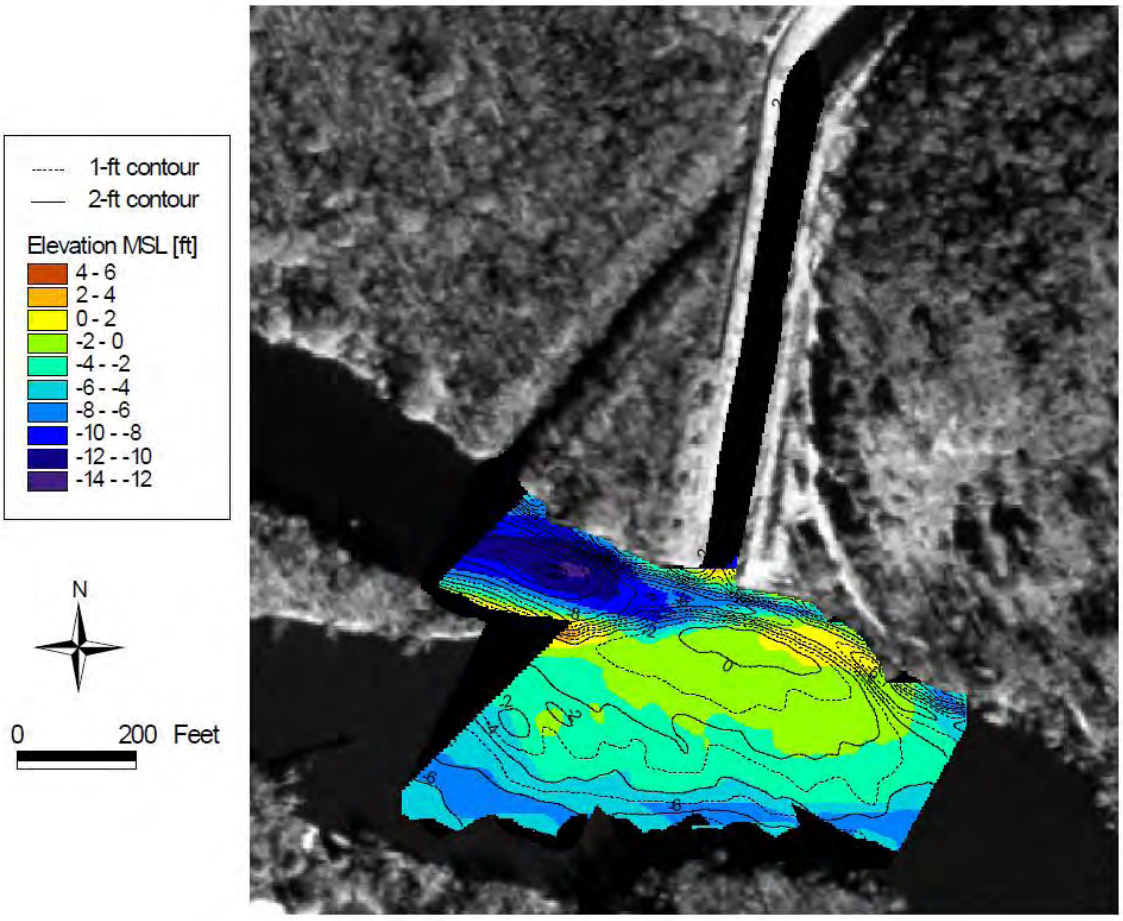
Abercorn Creek Bathymetry



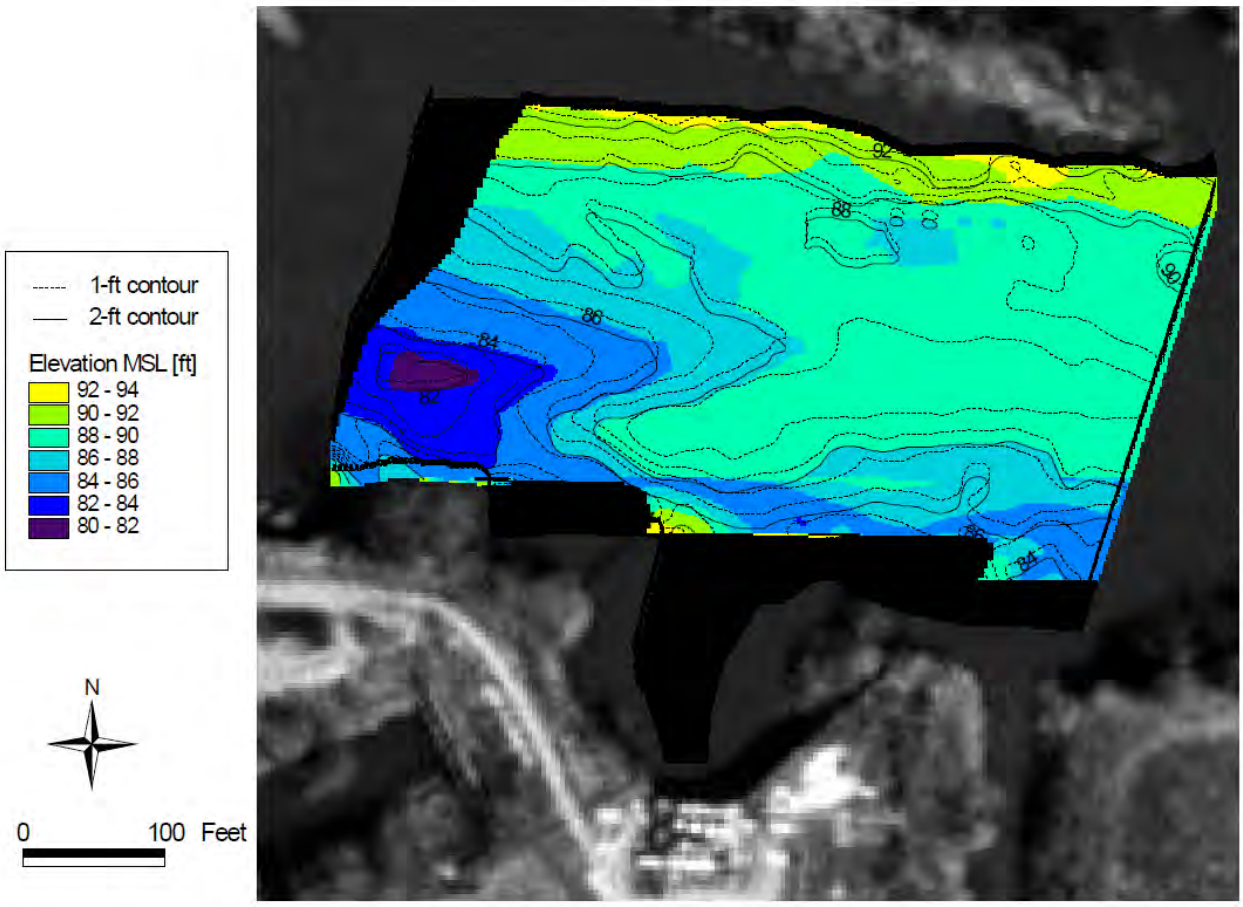
Georgia Pacific Bathymetry



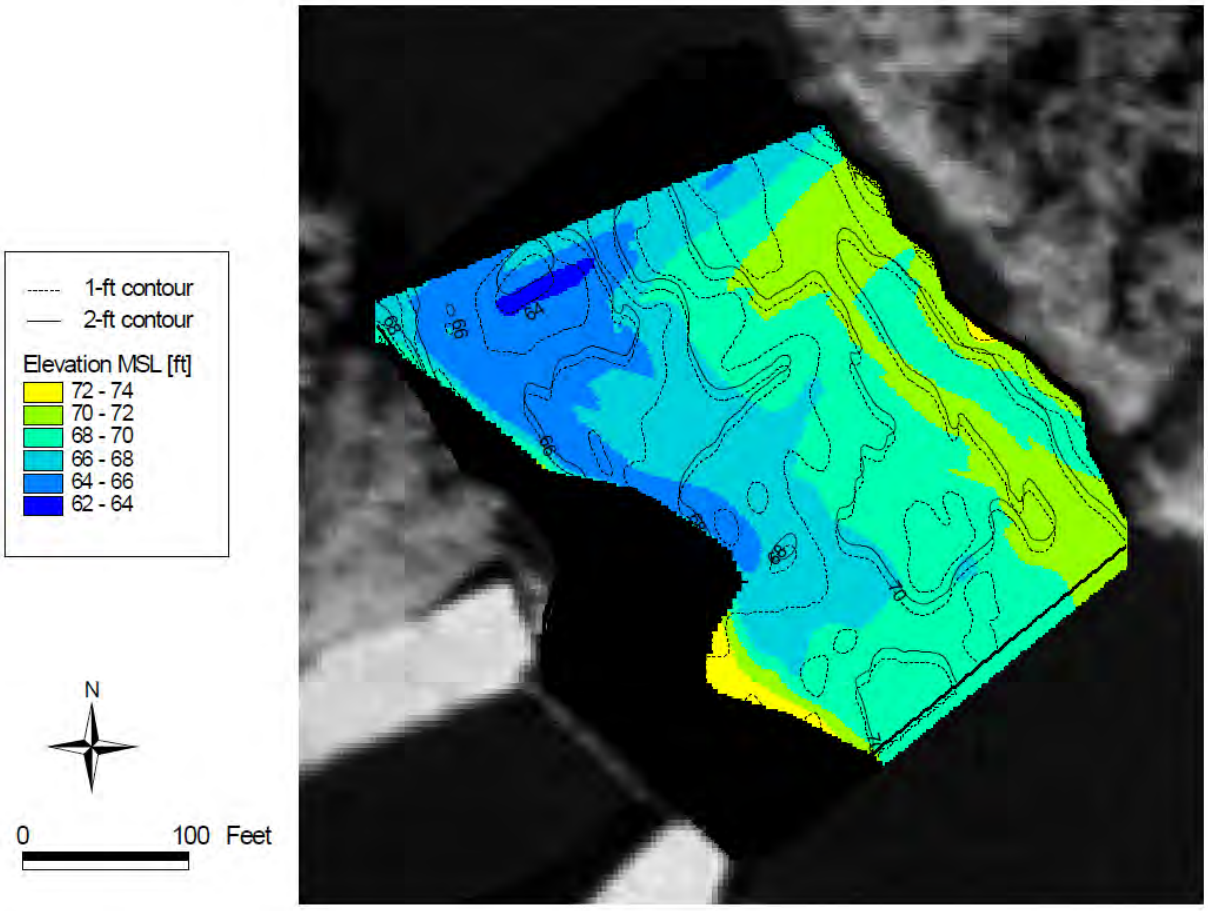
Hardeeville Bathymetry



International Paper Bathymetry



Vogtle Bathymetry



APPENDIX J

TURBINE PERFORMANCE AT LOW FOREBAY LEVELS

US Army Corps

of Engineers

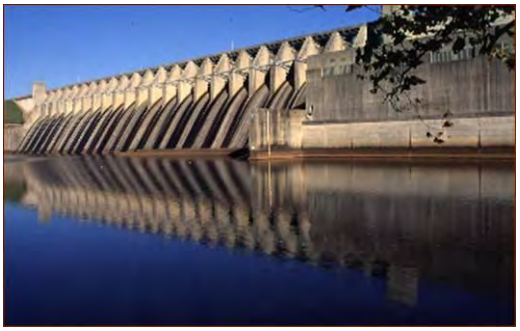
Savannah District Drought Study

Turbine Performance at Low Forebay Levels

HYDROELECTRIC DESIGN CENTER

Hartwell Project

R. B. Russell Project



G. Strom Thurmond Project

Prepared By:

Brian Moentenich, US Army Corps of Engineers, Portland District

Hydroelectric Design Center, January, 2010

PREPARED BY

Table of Contents

Turbine Performance at Low Forebay Levels

1.0 Executive Summary

If the reservoir levels fall by as much as 40 to 50 feet below the bottom of the conservation pool levels at the Thurmond, R. B. Russell and Hartwell projects, the turbines are expected to be able to discharge water – either by generating or by spinning at their synchronous speed and not generating.

2.0 Purpose

The purpose of this study is to determine if the turbines at the G. Strom Thurmond, R. B. Russell and Hartwell powerhouses will be able to continue to operate at lower than design reservoir and tailwater levels.

3.0 List of Assumptions

The following assumptions were made during the production of this report:

The powerhouse station service (house electrical power) will continue to operate normally.

The water cooling systems for the generators and turbines were designed with ample margins.

The turbines will be able to operate in generating mode satisfactorily down to 70% efficiency.

The performance of Hartwell turbine units 1-4 can be predicted by using Unit 5 model data.

4.0 References

The following documents were used in the production of this report:

G. Strom Thurmond turbine model test report

G. Strom Thurmond Unit 5 turbine field performance test report

R. B. Russell Units 1-4 turbine model test report

R. B. Russell Unit 3 turbine field performance test report

R. B. Russell Units 5-8 turbine model test report

Hartwell Unit 3 turbine field performance test report

Hartwell Unit 5 turbine model test report

Hartwell Unit 5 turbine field performance test report

Technical Paper entitled: "*Spring-supported thrust bearings used in hydroelectric generators: Should I be concerned about bearing temperature?*" by Jim Ferguson et al, GE Hydro, 2003.

Technical Paper entitled: "*Vortices at Intakes*" by J. L. Gordon, Hydro Division, Montreal Engineering Co. Ltd., Waterpower, April, 1970.

5.0 General

Operating a hydroelectric powerhouse at lower than design forebay levels can impact the ability of a turbine to operate satisfactorily. Lower forebay levels result in lower operating head. Lower forebay levels also can induce the formation of surface vortices which may entrain air. Where powerhouses are located in a river basin where the forebay level of one influences the tailwater level of an upstream project, then lower forebay levels also result in lower tailwater levels. This is the case for the Hartwell and R. B. Russell plants.

Lower tailwater levels also can impact turbine operation by causing the turbines to cavitate. Cavitation is the process of bubble formation[1] in low pressure regions and the subsequent bubble collapse when it flows into a region of higher pressure. Bubbles collapsing/imploding send out a shock wave which can cause metal fatigue over time if the location of the imploding bubbles are near a metal surface.

Historically, using turbine model performance to predict prototype (i.e. full – size) turbine performance has been found to be quite accurate. Some model test reports (especially the more recent ones) often have model performance information outside the guaranteed head range. Specifically, model runaway performance information often exists because guaranteed prototype runaway speeds were usually required to be verified during a model test. Note that runaway performance means no power is being generated. This is, in fact, the same as "speed-no-load" performance. In some cases, predicted model performance when generating power is provided over a wider head range than guaranteed. No model cavitation performance data is available outside the guaranteed operating range.

At the Thurmond, R. B. Russell and Hartwell powerhouses, there are a total of five "families" of turbines. These are: Thurmond Units 1-7, R. B. Russell Units 1-4, R. B. Russell Units 5-8, Hartwell Units 1-4, and Hartwell Unit 5. Every turbine within a family is identical.

6.0 Turbine Operation when Generating at Heads below Design Values

Usually a turbine will be able to operate satisfactorily when generating down to some value below it's minimum guaranteed operating head. Operating "satisfactorily" means the turbine is able to operate without excessive vibration and cavitation. It is generally believed by hydro turbine engineers that Francis[2] turbines should be able to operate satisfactorily down to about 70% efficiency.

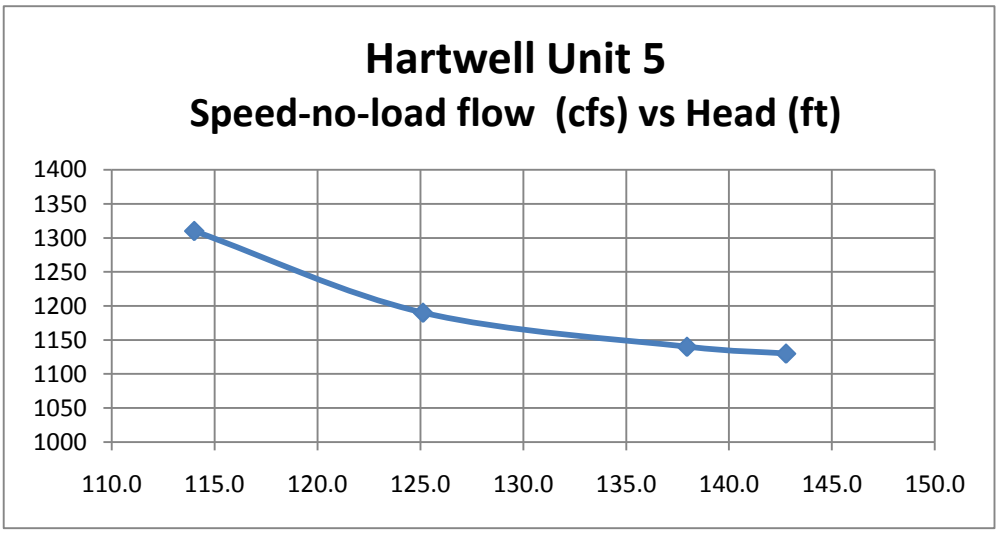
---

[1] The gas within these bubbles is water vapor and not air

[2] All of the turbines at the three plants are "Francis" type.

7.0 Turbine Operation at Speed-no-Load at Heads below Design Values

When operating a turbine in generating mode gets to be unacceptable due to low head or low forebay or tailwater elevations, then operation at speed-no-load (SNL) is the next option available to pass water through the turbine. This means the turbine is spinning at approximately ***synchronous speed*** and the circuit breaker is open (i.e. the generator is de-energized and no electrical power is being generated). While it is possible to operate the unit at higher than synchronous speed while not generating, it is not recommended. Even when not generating, the turbine will still be producing some power to overcome bearing friction and windage of the rotating parts. For example, the friction & windage power required for a Thurmond generating unit is approximately 500 hp. Speed-no-load operation is what occurs when a turbine is started and the generator is not yet connected to the line. The governor is designed to keep the unit at or near synchronous speed. Sustained speed-no-load operation should not be injurious to the turbine. When operated at SNL, the water flow rate through the turbine increases with decreasing head as can be seen in the graph for Hartwell Unit 5 shown below:



Operation at speed-no-load should be possible down to relatively low heads. It is probable that unacceptable operating behavior such as excessive vibration or shaft runout will occur before this head is reached. If that occurs, then the unit should be shut down. The decision to shut down the unit should be made by plant O&M personnel based upon observed unit behavior.

8.0 Unacceptable Operation Guidelines

There are no hard and fast guidelines on what constitutes excessive vibration or shaft runout. Most large turbines have shaft bearing clearances of 0.015” to 0.018”. During normal operation, the shaft runout seldom exceeds 0.003” to 0.005”. Therefore sustained shaft runouts exceeding 0.010” to 0.012” should be considered excessive.

Head cover vibration in the vertical direction in the vicinity of the packing box and draft tube door vibration in the horizontal direction may vary considerably from unit to unit. The vibrations should be measured on several units of the same family at various power levels and the results compared. Vertical vibration amplitudes of the head cover and/or horizontal amplitudes in the middle of the draft tube mandoor exceeding twice the normal maximum amplitudes should be considered to be excessive.

9.0 Turbine Discharge Measurement

One of the turbines in each family was tested shortly after commissioning using a process which measured actual turbine discharge. During these tests, the Winter-Kennedy piezometer taps were calibrated. This makes discharge measurement a relatively easy task. If the difference in pressure (as measured by a differential pressure gage) between the piezometer tap on the outside of the spiral case and one of the inner ones is known, then the discharge can be calculated using the appropriate formula[3] provided in the turbine field performance test report.

10.0 Cavitation Performance

Model cavitation performance data is not available outside the normal guaranteed operating range. However, the propensity for a turbine to cavitate generally decreases with decreasing power output and head. Lower than normal tailwater levels can, however, cause unacceptable cavitation damage. The final determination of the severity of cavitation on a prototype turbine when operated at heads and tailwater levels below design values remains with the plant operating staff. The onset of significant cavitation can usually be determined simply by listening to the noise generated – usually at the draft tube mandoor. Cavitation noise is distinctly different from other flow and turbulence-generated noise. Cavitation sounds more like popcorn popping or firecrackers going off as opposed to the more typical rumbling noise which is flow generated. It isn't possible to know just by listening if the collapse of cavitation bubbles[4] is attacking nearby metal surfaces or not. Bubbles collapsing away from metal surfaces cause no harm. If a unit is experiencing what sounds to be significant cavitation, it should be visually inspected periodically to determine if the metal surfaces are suffering unduly from cavitation attack.

11.0 Vibration and Rough Operation

Generally speaking, high noise levels do not always mean unacceptably rough operation. Measurements of vibration and shaft runout are usually more meaningful than noise level. Fortunately, such measurements are relatively easy to perform and special instrumentation is not required. Portable vibration monitors are widely available with probes to check the amplitude of vibration (in mils peak-to-

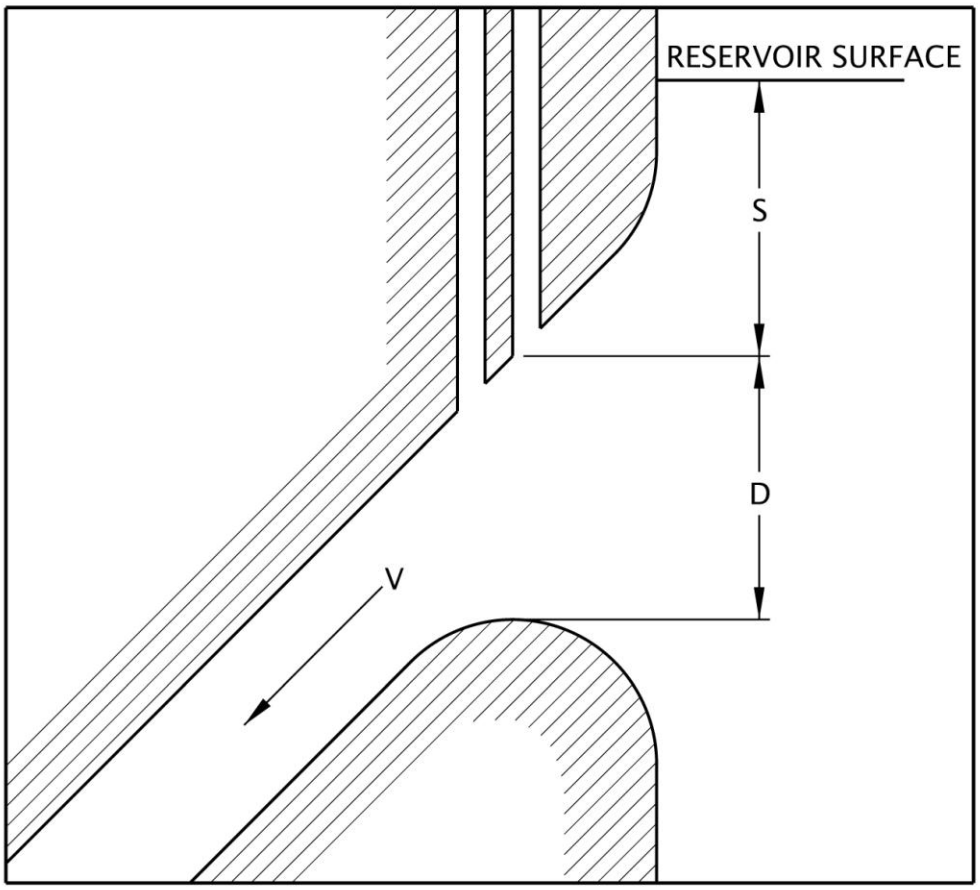
[3] Typically, more than one formula is provided because there are normally several pairs of *Winter-Kennedy* piezometer taps which were calibrated during the field performance test.

[4] The gas inside a cavitation bubble is water vapor and not air as is commonly believed. Vapor bubbles form when the local pressure drops to the vapor point which is approximately 0.5 psia at normal water temperatures.

peak) of any surface they touch. Also, dial indicators can be used to measure shaft runout. Measuring head cover vibration (in the vertical direction), draft tube mandoor vibration (in the horizontal direction) and the shaft runout at the turbine bearing will provide valuable information on rough operation. These tools are not expensive and can be used for other maintenance needs.

12.0 Surface Vortex Formation

As the forebay levels decrease, there is less submergence of the top of the penstock intake. Surface vortex formation is generally not a problem until the vortices begin to entrain air. Air passing through the turbine may cause rough operation. There is very little research available on vortex formation in intakes for hydroelectric powerhouses. The April, 1970 edition of *Waterpower* contained an article written by J. L. Gordon entitled "Vortices at Intakes".



The data was based upon observation of a total of 29 intakes of hydro plants when at low reservoir levels. It was used as a basis of estimating minimum acceptable forebay levels due to formation of air-entraining vortices when generating and when operating at speed-no-load. It needs to be noted that the resulting reservoir limits from using J. L. Gordon's formula are not hard. Small and moderate volumes of air passing through a turbine may not induce unacceptably rough operation. Actual unit

roughness should be used (to decide to shut down a unit) if very low reservoir levels actually occur. J. L. Gordon's formula was used to predict, for planning purposes, when air-entraining vortices would begin to form. For symmetrical intakes, the following formula was empirically developed by J. L. Gordon:

$$S = 0.3 * V * (D)^{0.5}$$

Where: S is the minimum submergence depth (ft) from the reservoir surface to the upper stationary intake gate sealing surface (see sketch)

V is the velocity of flow in the penstock in ft/sec.

D is the intake gate height in feet

For Hartwell Unit 5, the elevation of the top of the gate seal is approximately at 568 FMSL[5], the gate height is approximately 28 feet and the penstock diameter is 24 feet.

For a discharge of 6,000 ft^3/sec., S is calculated to be 21 feet. This would yield a minimum reservoir elevation (to prevent vortices) of approximately 590 FMSL when the unit is generating power. For a speed-no-load discharge of 1,400 ft^3/sec., the minimum forebay would be approximately 575 FMSL.

13.0 Cooling & Lubricating Water

There are some additional things to consider when determining what is the minimum forebay level a turbine-generating unit can operate at. Water for cooling the generator stator windings, the main shaft bearings and lubricating the turbine shaft packing and the upper and lower turbine seal rings is required. The source of this water for each of the three powerhouses[6] is the forebay via a connection to the penstock. Therefore, some water will always be provided to the respective systems. There is no way to predict if adequate flow rates will exist to permit the units to operate either in generating mode or speed-no-load mode. However, it is quite likely that adequate flow rates will exist as Corps powerhouse designers were typically quite conservative.

Generator cooling water flow rates are usually quite restricted during normal operation to maintain desired stator temperatures. Usually much more flow is possible simply by opening the control valves. The generators should not be operated above their stator RTD (resistance temperature detector) limits. If the RTD limit is reached, then generation should be stopped and the speed-no-load mode of operation should be commenced if the head continues to be reduced.

Most bearing cooling water systems were generously sized. In fact, the bearings at many Corps plants usually operate at very low temperatures because operators commonly want an extra margin of

[5] Feet Mean Sea Level

[6] For the R.B. Russell Units 5-8, water is gravity fed from the penstock when generating and pumped from the tailrace when pumping.

protection & open the valves (sometimes full open) all the time. As the head is decreased, bearing temperatures will be elevated from normal levels. This should not be a problem until the shoe RTD Temperature exceeds 90^{o}C . This is a very high temperature for a bearing. However, thrust & guide bearings can and do run as hot as that at many plants and have done so for decades without problems[7].

14.0 Prior Operation of Turbines at Low Reservoir Levels

During the winter of 2008, the Savannah River flow rate was reduced to extremely low levels due to a drought in the region. As a result of this drought, reservoir levels were lower than normal but still above the bottom of their conservation pools.

14.1 Thurmond Powerhouse

The normal minimum forebay level is 312.0 FMSL which is also the top of the inactive storage pool[8]. The minimum observed forebay level in the past four years was 313.68 FMSL. The minimum observed tailwater elevation in the past four years was 178.34 FMSL. All of the turbines operated normally during these conditions. When the Thurmond pool was being filled for the first time, the units were operated in the generating mode satisfactorily with a forebay level as low as 292 FMSL.

14.2 R. B. Russell Powerhouse

The normal minimum forebay level is 470.0 FMSL which is also the top of the inactive storage pool. The minimum observed forebay level in the past four years was 473.64 FMSL. The minimum observed tailwater elevation in the past four years was 312.33 FMSL. All of the turbines operated normally during these conditions.

14.3 Hartwell Powerhouse

The normal minimum forebay level is 625.0 FMSL which is also the top of the inactive storage pool. The minimum observed forebay level in the past four years was 649.5 FMSL. The minimum observed tailwater elevation in the past four years was 476.64 FMSL. All of the turbines operated normally during these conditions.

15.0 Turbine Operation based upon Predicted Performance for Planning Purposes

The following operating guidelines are based upon extrapolation of the data in the turbine model test report for each family of units[9] and upon research performed on vortex formation in turbine intakes. The data should be used for *planning* purposes . *If and when extreme low forebay levels actually occur,*

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[7] *Spring-supported thrust bearings used in hydroelectric generators: Should I be concerned about bearing temperature?* by Jim Ferguson et al, GE Hydro, presented at Waterpower XIII Conference, 2003.

[8] The bottom of the conservation pool is the top of the inactive storage pool.

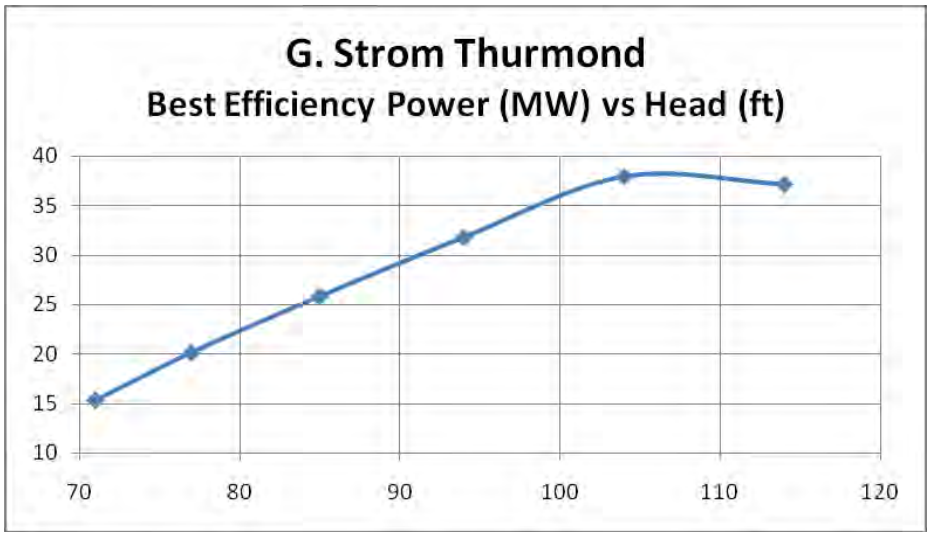
[9] Model data for Hartwell units 1-4 was unavailable so the model data for Unit 5 was used for Units 1-4.

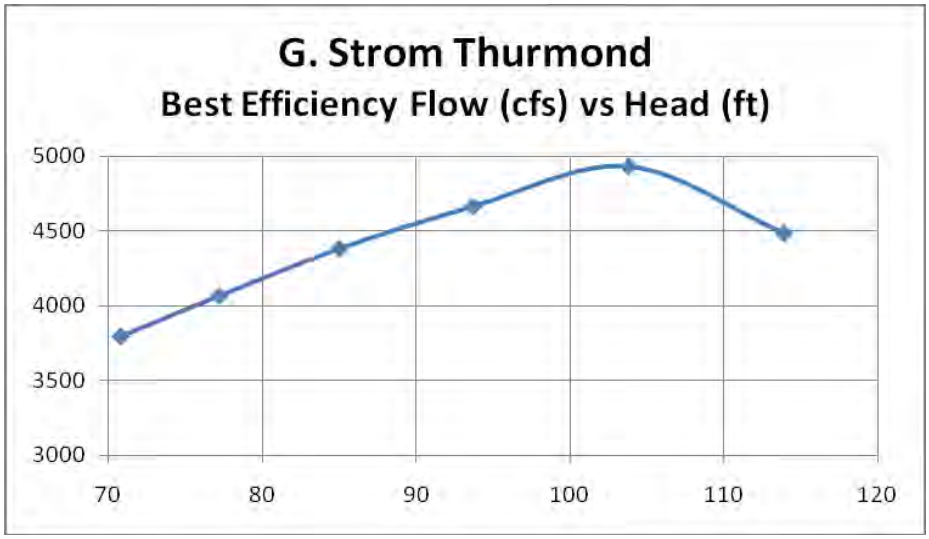
decisions to continue unit operation should be made by plant O&M personnel based upon observed unit behavior. Note that head is sometimes referred to as "head" and also as "net head". The term "head" means the gross difference between the forebay and tailrace water surface elevations. Turbines are always rated & guaranteed to operate at "net head" which is gross head minus intake losses. Intake head loss includes sudden contraction loss, trash rack loss and friction loss in the penstock. For example, at Hartwell, the intake loss for Unit 5 is approximately 1 foot at a turbine discharge of 6,000 ft^3/sec. and less than 0.1 foot at a discharge of 1,400 ft^3/sec.

15.1 G. Strom Thurmond Units 1-7

These turbines were designed to operate satisfactorily over a net head range from 148.5 feet down to 114 feet. There is no reason to believe the turbines will not continue to operate in an acceptable manner at some heads lower than 114 feet. Continuing to operate the turbine while generating power at or near best efficiency should be possible down to a forebay level of 294 FMSL. This would result in a net head on the turbine of approximately 109 ft. (assuming a tailwater elevation of 184 FMSL and an intake head loss of one foot). When generating below a forebay level of 294 FMSL, air-entraining vortices in the intake are predicted to begin to form which may cause the turbine to run unacceptably rough.

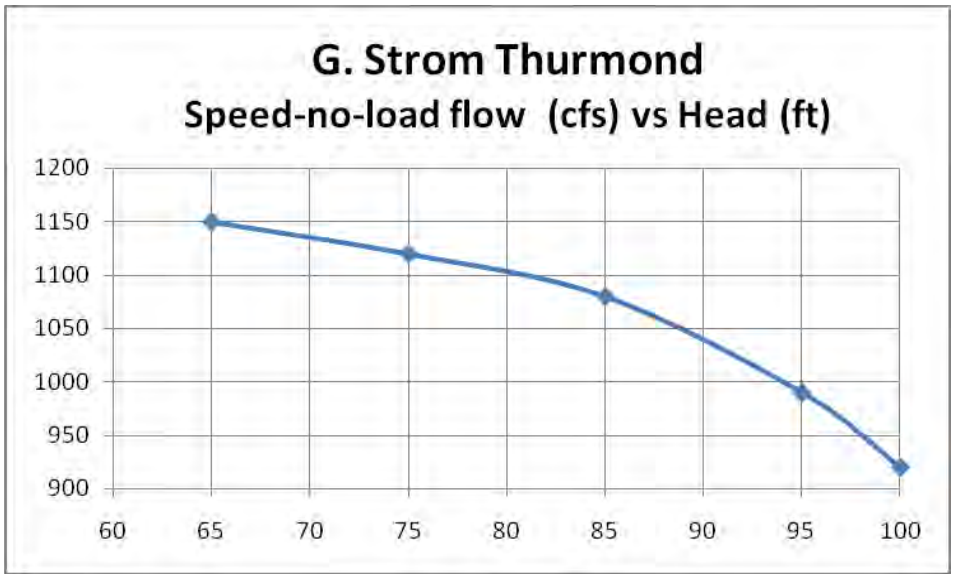
G. Strom Thurmond Best Efficiency Generation Peformance			
Head (ft)	*Power (MW)*	*Q (cfs)*	*Forebay (FMSL)*
71	15	3800	256
77	20	4070	262
85	26	4380	270
94	32	4660	279
104	38	4930	289
114	37	4490	299





Operating the turbine in a speed-no-load condition should be possible at all forebay elevations down to 275 FMSL where again air-entraining vortices are predicted to commence.

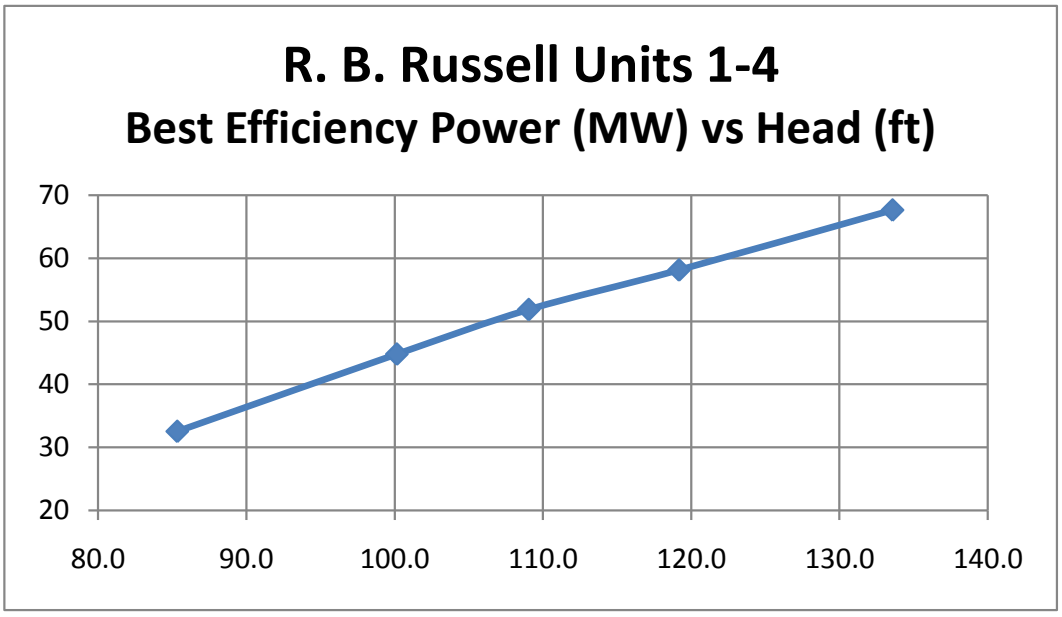
Thurmond Speed-no-Load Performance		
Head (ft)	*Flow (cfs)*	*Forebay (FMSL)*
65	1150	249
75	1120	259
85	1080	269
95	990	279
100	920	284

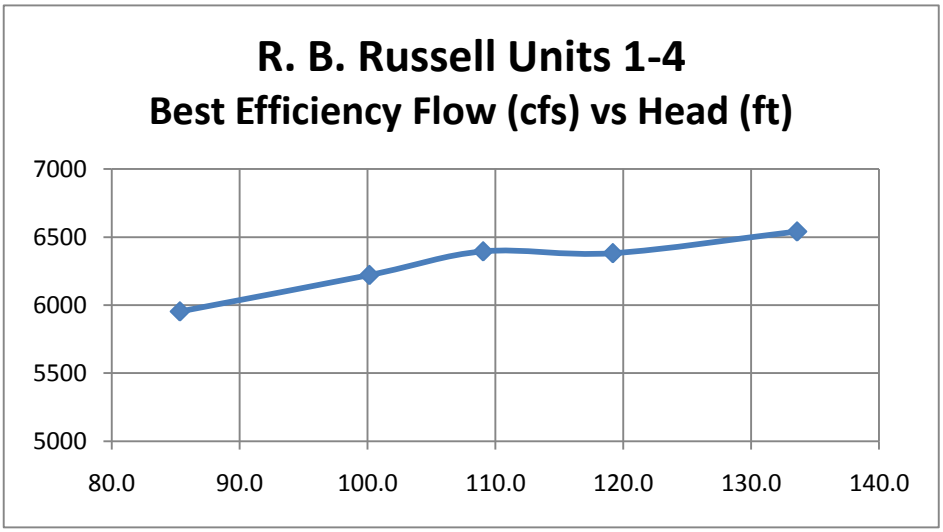


15.2 Richard B. Russell Units 1-4

These turbines were designed to operate satisfactorily over a net head range from 162 feet down to 134 feet. There is no reason to believe they will not continue to operate in an acceptable manner at some heads lower than 134 feet. Continuing to operate the turbine while generating power at or near best efficiency should be possible down to a forebay level of 434 FMSL. This would result in a net head on the turbine of approximately 113 ft. (assuming a tailwater elevation of 318 FMSL and an intake head loss of one foot). When generating below a forebay level of 434 FMSL, air-entraining vortices in the intake are predicted to begin to form which may cause the turbine to run unacceptably rough.

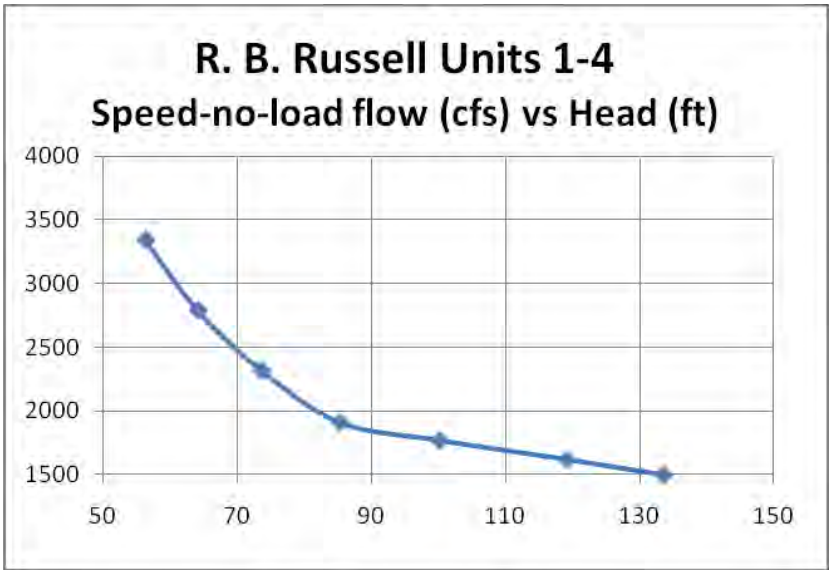
R. B. Russell Units 1-4 Best Efficiency Generation Performance			
Head (ft)	*Power (MW)*	*Q (cfs)*	*Forebay (FMSL)*
85	33	5950	396
100	45	6220	411
109	52	6400	420
119	58	6380	430
134	68	6540	445





Operating the turbine in a speed-no-load condition should be possible at all forebay elevations down to 418 where again air-entraining vortices are predicted to commence.

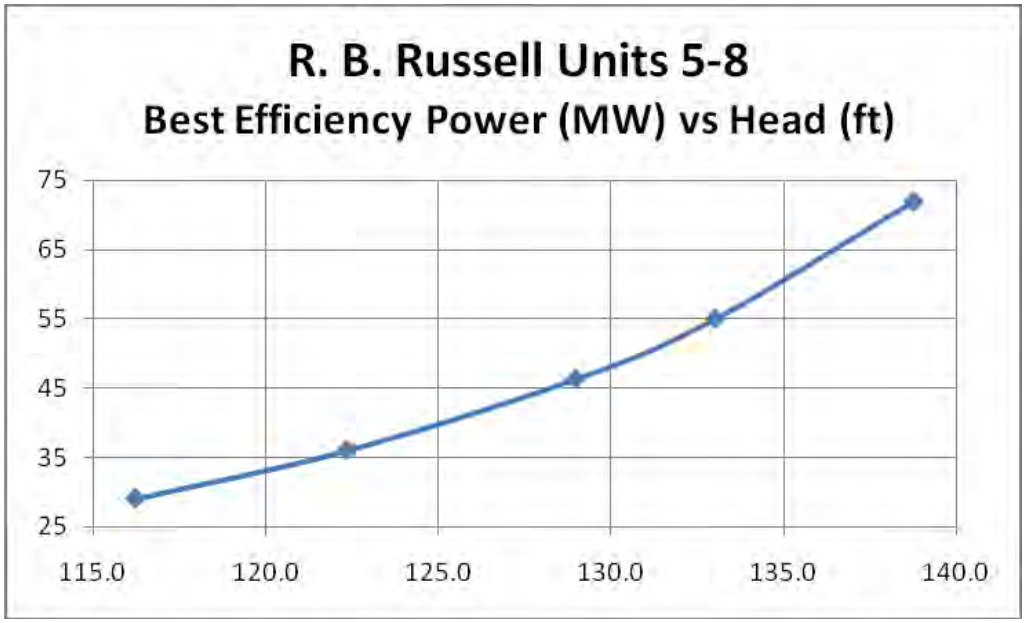
RB Russell Units 1-4 Speed-no-Load Performance		
Head (ft)	*Flow (cfs)*	*Forebay (FMSL)*
56	3340	366
64	2790	374
74	2320	384
85	1910	395
100	1770	410
119	1620	429
134	1500	444

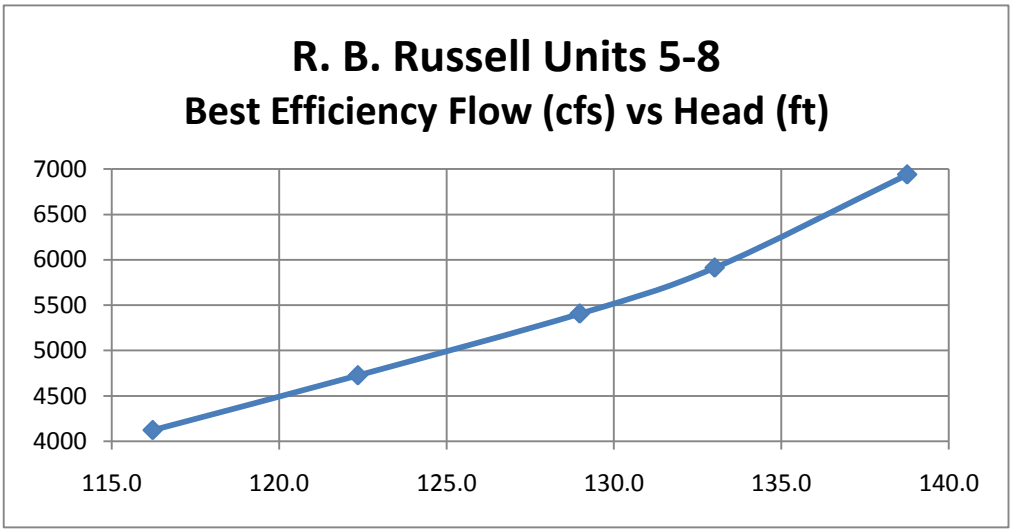


15.3 Richard B. Russell Units 5-8

These turbines were designed to operate satisfactorily over a net head range from 162 feet down to 139 feet. There is no reason to believe the turbines will not continue to generate in an acceptable manner at some heads lower than 139 feet. Continuing to operate the turbine while generating power at or near best efficiency should be possible down to a forebay level of 430 FMSL. This would result in a net head on the turbine of approximately 117 ft. (assuming a tailwater elevation of 312 FMSL and an intake head loss of one foot). When generating below a forebay level of 430 FMSL, air-entraining vortices in the intake are predicted to begin to form which may cause the turbine to run unacceptably rough.

R. B. Russell Units 5-8 Best Efficiency Generation Performance			
Head (ft)	*Power (MW)*	*Q (cfs)*	*Forebay (FMSL)*
116	29	4120	427
122	36	4730	433
129	46	5410	440
133	55	5910	444
139	72	6940	450

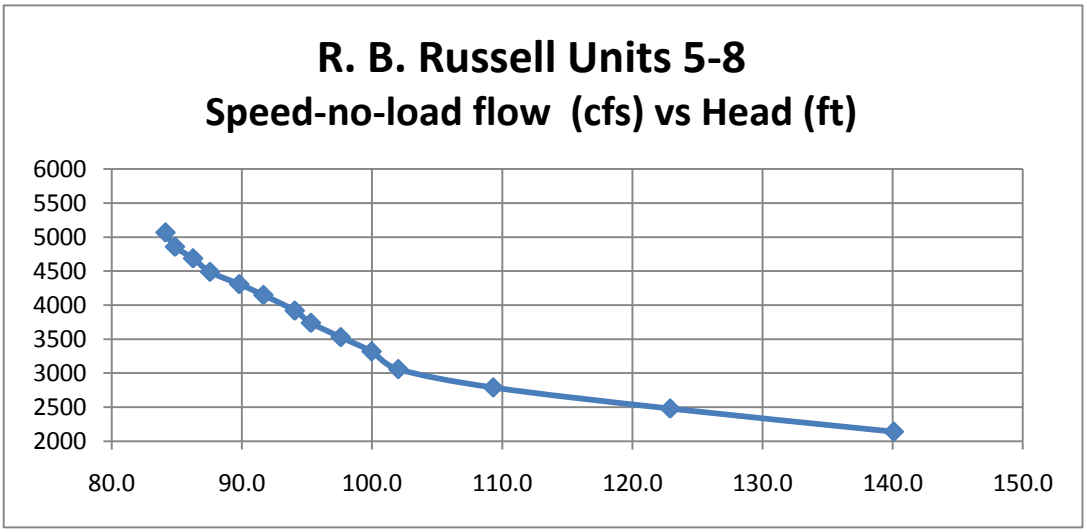




Operating the turbine in a speed-no-load condition should be possible at all forebay elevations down to 415 FMSL where again air-entraining vortices are predicted to commence. A forebay level of 415 FMSL would result in a net head across the turbine of 103 feet.

R. B. Russell Units 5-8 Speed-no-Load Performance

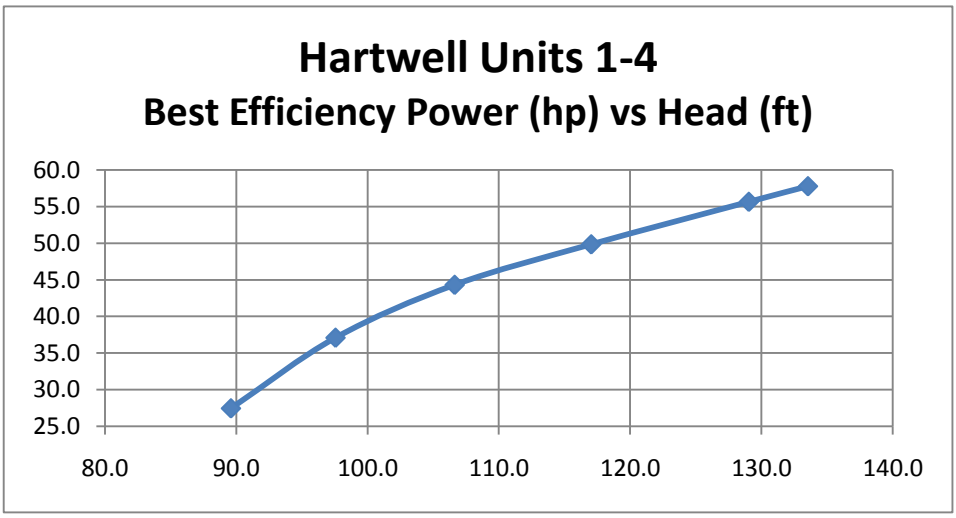
Head (ft)	*Flow (cfs)*	*Forebay (FMSL)*
84	5070	394
85	4860	395
86	4690	396
88	4490	398
90	4310	400
92	4150	402
94	3920	404
95	3740	405
98	3530	408
100	3320	410
102	3060	412
109	2790	419
123	2480	433
140	2140	450

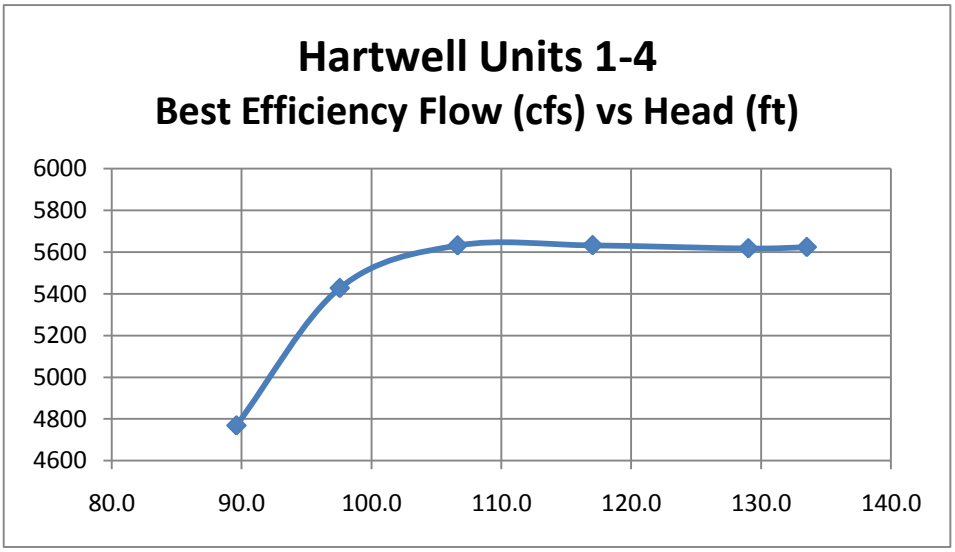


15.4 Hartwell Units 1-4

No turbine model data was available to predict unit performance. The model data for Unit 5 was used to predict performance of Units 1-4. These turbines were designed to operate satisfactorily over a net head range from 187 feet down to 144 feet. There is no reason to believe they will not continue to operate in an acceptable manner at some heads lower than 144 feet. Continuing to operate the turbine while generating power at or near best efficiency should be possible down to a forebay level of 596 FMSL. This would result in a net head on the turbine of approximately 122 ft. (assuming a tailwater elevation of 473 FMSL and an intake head loss of one foot). When generating below a forebay level of 596 FMSL, air-entraining vortices in the intake are predicted to begin to form which may cause the turbine to run unacceptably rough.

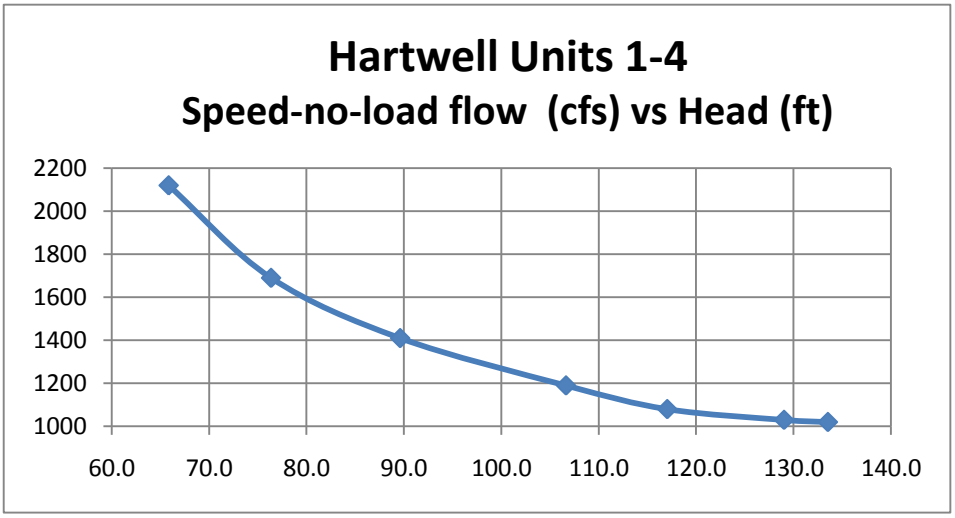
Hartwell Units 1-4 Best Efficiency Generation Performance			
Head (ft)	*Power (MW)*	*Q (cfs)*	*Forebay (FMSL)*
90	27	4770	564
98	37	5430	572
107	44	5630	581
117	50	5630	591
129	56	5620	603
134	58	5620	608





Operating the turbine in a speed-no-load condition should be possible at all forebay elevations down to 574 FMSL where again air-entraining vortices are predicted to commence.

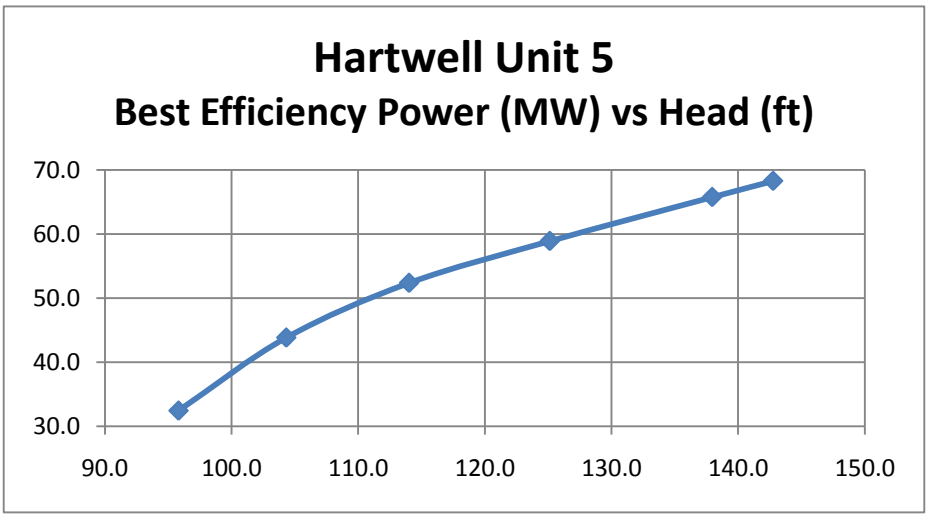
Hartwell Units 1-4 Speed-no-Load Data		
Head (ft)	*Flow (cfs)*	*Forebay (FMSL)*
66	2120	539
76	1690	549
90	1410	563
107	1190	580
117	1080	590
129	1030	602
134	1020	607

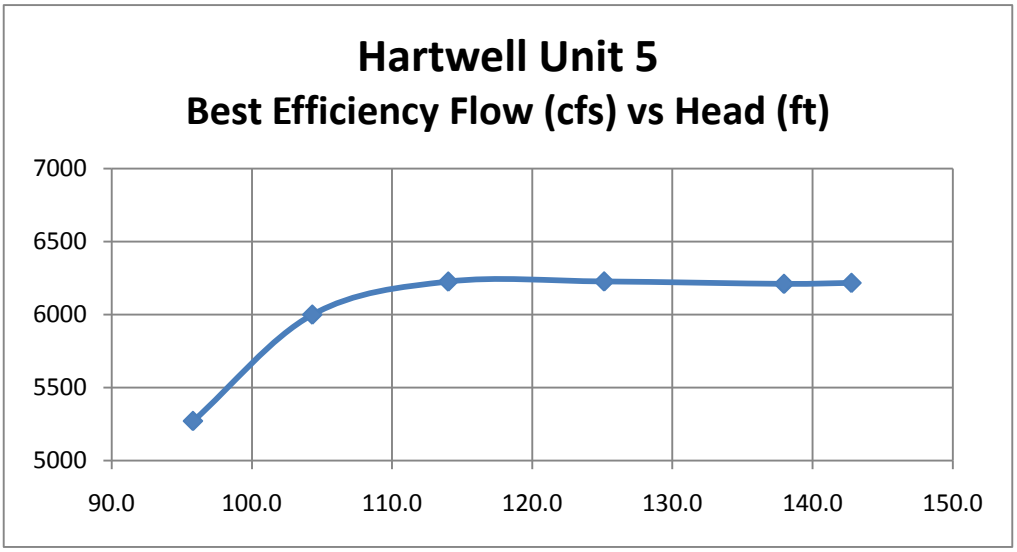


15.5 Hartwell Unit 5

This turbine was designed to operate satisfactorily over a net head range from 187 feet down to 143 feet. There is no reason to believe it will not continue to operate in an acceptable manner at some heads lower than 143 feet. Continuing to operate the turbine while generating power at or near best efficiency should be possible down to a forebay level of 591 FMSL. This would result in a net head on the turbine of approximately 117 ft. (assuming a tailwater elevation of 473 FMSL and an intake head loss of one foot). When generating below a forebay level of 591 FMSL, air-entraining vortices in the intake are predicted to begin to form which may cause the turbine to run unacceptably rough.

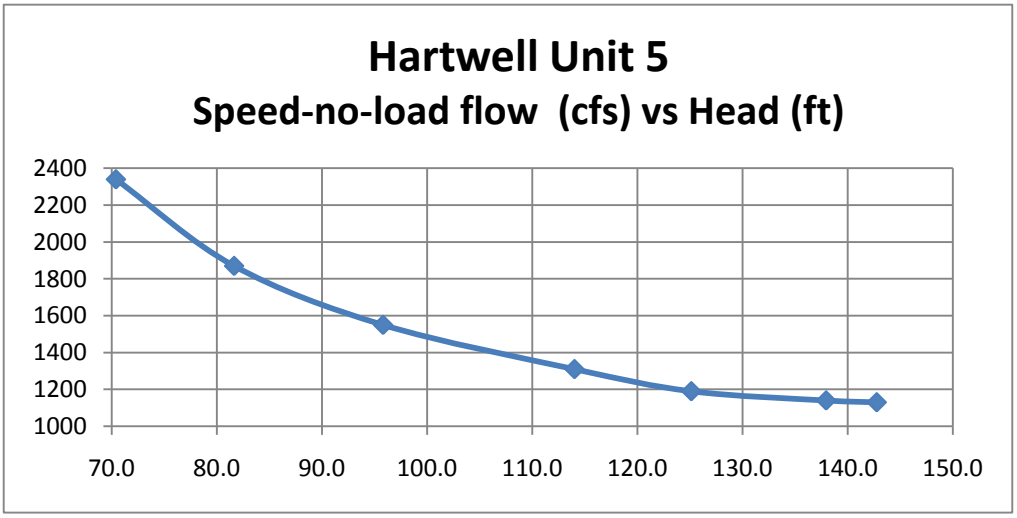
Hartwell Unit 5 Best Efficiency Generation Performance			
Head (ft)	*Power (MW)*	*Q (cfs)*	*Forebay (FMSL)*
96	32	5270	570
104	44	6000	578
114	52	6230	588
125	59	6230	599
138	66	6210	612
143	68	6220	617





Operating the turbine in a speed-no-load condition should be possible at all forebay elevations down to 573 FMSL where again air-entraining vortices are predicted to commence.

Hartwell Unit 5 Speed-no-Load Performance		
Head (ft)	*Flow (cfs)*	*Forebay (FMSL)*
70	2340	543
82	1870	555
96	1550	569
114	1310	587
125	1190	598
138	1140	611
143	1130	616



16.0 Summary of Planned Operation at Extreme Low Forebay Levels

Shown below is a table of various minimum forebay levels which should be used for planning purposes for powerhouse operating guidelines to use the turbines to pass minimum flows during drought conditions. The data shown is a summary of the data provided in paragraphs 11.1 through 11.5 above. At forebay levels above "Design", the turbines will be operating normally within their design net head range. At forebay levels between "Design" and "Generation", the turbines should be operated in the generating mode at the turbine's best efficiency point. At forebay levels between "Generation" and "Speed-no-Load", the turbines should be operated in speed-no-load mode. At forebay elevations lower than those listed under "Speed-no-Load", water passage should be done using other means such as the sluice gates.

Summary of Operations at Various Forebay Levels					
		Minimum Forebay Level (FMSL)			Assumed Tailwater level
Powerhouse	*Units*	*Design*	*Generation*	*Speed-no-Load*	(FMSL)
G. Strom Thurmond	1-7	312	294	275	184
R. B. Russell	1-4	470	434	418	310
R. B. Russell	5-8	470	430	415	310
Hartwell	1-4	625	596	574	473
Hartwell	5	625	591	573	473

The table above is based upon *predicted unit performance* and should be used for planning purposes only. If the forebay levels actually do drop below their design values, the determination of when to change modes should be made by powerhouse O&M personnel based upon observed unit behavior. Also, if the unit runs smoother (when generating) at a different power output, it should be operated there.

APPENDIX K

LIST OF PREPARERS

LIST OF PREPARERS

Larry Olliff	USACE Planning - Environmental
Biologist	29 years USACE
William Bailey	USACE Planning
Physical Scientist	29 years USACE
Stan Simpson	USACE Engineering - Water Management
Water Manager	27 years USACE
Jason Ward	USACE Engineering - Water Management
Water Manager	8 years USACE

APPENDIX L

PUBLIC NOTICE

DEPARTMENT OF THE ARMY
SAVANNAH DISTRICT, CORPS OF ENGINEERS
P.O. BOX 889
SAVANNAH, GEORGIA 31402-0889

REPLY TO
ATTENTION OF:

Planning Division

June 14, 2011

JOINT PUBLIC NOTICE
US Army Corps of Engineers, Savannah District,
and the
Georgia Department of Natural Resources, Coastal Resources Division
and the
South Carolina Department of Health and Environmental Control Office of Ocean and Coastal Resource Management

TO WHOM IT MAY CONCERN:

SUBJECT: Notice of Availability of a Draft Environmental Assessment (EA) and Draft Finding of No Significant Impact (FONSI) for a modification to the US Army Corps of Engineers' Savannah River Basin Drought Contingency Plan (SRBDCP) on the Savannah River in Georgia and South Carolina.

Notice of the following is hereby given:

a. Pursuant to the National Environmental Policy Act of 1969, notice is hereby given that the US Army Corps of Engineers, Savannah District proposes a modification to the March 1989 SRBDCP, as revised.

b. The Savannah District announces the availability to the public of a Draft EA and Draft FONSI concerning the action. Copies of the Draft EA and unsigned FONSI can be obtained from the following website: http://www.sas.usace.army.mil/planning/ or by calling Larry Olliff at (912)652-5690.

c. Written statements regarding the Draft EA and FONSI for the proposed action will be received at the Savannah District Office until

12 O'CLOCK NOON, July 14, 2011

from those interested in the activity and whose interests may be affected by the proposed action.

PROJECT DESCRIPTION: The proposed action consists of a modification to the 1989 SRBDCP. Average daily releases from J. Strom Thurmond (JST) Dam would be reduced from 3,600 to 3,100 cubic feet per second (cfs) during the period 1 November through 28 February, when the Corps' reservoirs on the Savannah River are in Level 4 drought conditions. The action would retain the major components of the 1989 SRBDCP and adjust one feature (discharge during winter) to proactively manage outflow from those Corps projects.

Alternatives to the Proposed Action were developed as part of the planning process. The alternatives that were considered were as follows:

a) No Action Alternative (Continue with the 1989 SRBDCP as updated in 2006 which includes an average discharge from J. Strom Thurmond (JST) Dam of 3,600 cfs for drought level 4.)

b) Alternative 1 (Selected Alternative): Retain the major components of the 1989 SRBDCP and adjust one feature. If Level 4 drought conditions exist, the daily average release at Thumond Dam would be adjusted from 3,600 cfs to 3,100 cfs during the period 1 November through 28 February.

AUTHORIZATIONS REQUIRED FROM THE STATE OF GEORGIA:

Coastal Zone Consistency: Savannah District has evaluated the proposed project and believes it is consistent with the Georgia Coastal Zone Management Program to the maximum extent practicable. The District will submit its evaluation to the Georgia Department of Natural Resources, Coastal Resourses Division in Brunswick, Georgia, who administers that program.
The State will review the proposed action and determine whether it concurs that the proposed project is consistent with the State's Coastal Zone Management Program to the maximum extent practicable. Any person who desires to comment or object to Georgia Coastal Zone Management Consistency Certification must do so in writing within 30 days of the date of this notice to the Federal Consistency Coordinator, Georgia Department of Natural Resources, Coastal Resources Division, Suite 300, One Conservation Way, Brunswick, Georgia 31520-8687 and state the reasons or basis for the objections.

AUTHORIZATION REQUIRED FROM THE STATE OF SOUTH CAROLINA:

Coastal Zone Consistency: Savannah District has evaluated the proposed project and believes it is consistent with the South Carolina Coastal Zone Management Program to the maximum extent practicable. The District will submit its evaluation to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management in Charleston, South Carolina, who administers that program. The State will review the proposed action and determine whether it concurs that the proposed project is consistent with the State's Coastal Zone Management Program to the maximum extent practicable. Any person who desires to comment or object to South Carolina Coastal Zone Management Consistency Certification must do so in writing within 30 days of the date of this notice to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management; 1362 McMillan Avenue; Suite 400, Charleston, South Carolina 29405 and state the reasons or basis for the objections.

DEPARTMENT OF THE ARMY EVALUATION:

Environmental Assessment: Savannah District has prepared a Draft Environmental Assessment (EA) and found that an Environmental Impact Statement will not be required for this action. The Draft EA is being coordinated concurrently with this Notice to Federal and State natural resource agencies for review and comment. No wetlands would be filled, but riparian wetlands could be temporarily impacted by reduced river flows. No discharge of dredged or fill material into waters of the US is included in the proposed action, so no evaluation is required under Section 404 of the Clean Water Act.

Threatened and Endangered Species: The District reviewed the most recent information on Federally-listed endangered or threatened species and determined that the proposed action may effect, but is not likely to affect shortnose sturgeon, manatee, and wood stork. This proposed action is being coordinated with the US Fish and Wildlife Service and the National Marine Fisheries Service under Section 7 of the Endangered Species Act.

Cultural Resources: In accordance with the National Historic Preservation Act (P.L. 89-655, as amended) and 36 CFR, Part 800, Savannah District has evaluated the proposed action's potential effect upon historic properties. The District has determined the proposed action will have no adverse effect upon historic properties and has initiated consultation with the Georgia and South Carolina State Historic Preservation Officers and eighteen Native American Tribes.

Essential Fish Habitat: Savannah District evaluated the proposal's potential effects on Essential Fish Habitat. The project's effects would be of relatively short duration. As a result, the District believes the proposed action would not produce long term effects on these valuable coastal habitats that warrant

mitigation. The District is coordinating the proposed action with the National Marine Fisheries Service under the Magnuson-Stevens Fishery Conservation and Management Act.

Coastal Zone Consistency: Savannah District evaluated compliance of the proposed action with both the Georgia and South Carolina Coastal Management Programs (CMP). The District believes that the proposed action is consistent with the CMPs to the maximum extent practicable. The District will submit the EA to the Georgia Department of Natural Resources, Coastal Resources Division in Brunswick, Georgia and to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management in Charleston, South Carolina.

Public Interest Review: The Decision whether to proceed with the project as proposed will be based on an evaluation of the probable impact, including cumulative impacts, of the proposed activity on the public interest. That decision will reflect the national concern for both the protection and use of important resources. The benefits which reasonably may be expected to accrue from the proposal will be balanced against its reasonably foreseeable detriments. All factors that may be relevant to the proposal will be considered, including the cumulative effects thereof. Among these are conservation, economics, aesthetics, general environmental concerns, wetlands, historic properties, fish and wildlife, flood hazards, flood plains, land use, navigation, shoreline erosion/accretion, recreation, water supply and conservation, water quality, energy needs, safety, food and fiber production, mineral needs, consideration of property ownership, environmental justice, and, in general, the needs and welfare of the people.

Consideration of Public Comments: The US Army Corps of Engineers is soliciting comments from the public; Federal, State, and local agencies and officials; Native American Tribes; and other interested parties in order to consider and evaluate the impacts of the proposed activity. Any comments received will be considered by the US Army Corps of Engineers in its deliberations on this action. To make this decision, comments are used to assess impacts to endangered species, wetlands, historic properties, water quality, general environmental effects, socioeconomic effects, and the other public interest factors listed above. Comments are used in the preparation of the Environmental Assessment pursuant to the National Environmental Policy Act. Comments are also used to determine the need for a public hearing and to determine the overall public interest of the proposed activity.

Comment Period: Anyone wishing to comment to the Corps on this proposed action should submit comments no later than the end of the comment period shown in this notice, in writing, to the US Army Corps of Engineers, Attn: PD, Savannah District, Savannah, Georgia 31402-0889, by FAX to 912-652-5787, or by emailing the comments to the following address: CESAS-PD@usace.army.mil.

Any person who desires to comment or object to Georgia Coastal Zone Management Consistency Certification must do so in writing to the Georgia Department of Natural Resources, Coastal Resources Division, Federal Consistency Coordinator, Suite 300, One Conservation Way, Brunswick, Georgia 31520-8687.

Any person who desires to comment or object to South Carolina Coastal Zone Management Constency Certification must do so in writing to the South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management; 1362 McMillan Avenue; Suite 400, Charleston, South Carolina 29405.

William G. Bailey
Chief, Planning Division
Savannah District
US Army Corps of Engineers

APPENDIX M

COMMENT LETTERS

From:	bill.payne@srs.gov
To:	CESAS-PD, SAS
Cc:	Birdwell, Billy E SAS; Ward, Jason M SAS; Simpson, Stanley L SAS; WILSONDE@dhec.sc.gov; RentiersK@dnr.sc.gov; gary.hoover@srs.gov; Kevin.Kostelnik@srs.gov
Subject:	SAVANNAH RIVER NUCLEAR SOLUTIONS (SRNS) COMMENTS REGARDING USACE DROUGHT CONTINGENCY PLAN DRAFT EA AND FONSI
Date:	Thursday, July 07, 2011 2:37:25 PM

Ladies and Gentlemen,

Please accept the following comments regarding the USACE's proposed changes to their Savannah River Basin Drought Contingency Plan.

1. SRNS supports a reduction in the discharge rate of water from Thurmond Reservoir, as proposed in the draft EA. However, as we have commented in previous years when such a reduction has been proposed, SRNS is concerned that the USACE will not increase the discharge rate unless a request is made by either a South Carolina or Georgia agency. If the river level at the Savannah River Site (SRS) pump intakes falls low enough to jeopardize withdrawal, SRNS may require a quick response from the USACE to correct the situation. Although SRNS anticipates that South Carolina would respond appropriately, it is not clear that the process would work quickly enough to prevent problems. If SRS cannot withdraw water from the Savannah River, significant operational, safety, and environmental problems would likely result. SRNS requests that the EA be revised to allow river water users (withdrawers) to make a request directly to the USACE to increase the release rate from Thurmond Reservoir, as needed, to prevent significant operational, safety, or environmental problems.
2. It should be noted that the Thurmond Reservoir release rate during December 2008 and January 2009 averaged less than 3,100 cfs, although the revised EA stated that it would be maintained at 3,100 cfs. SRNS understands that it is impossible to maintain a constant discharge rate of 3,100 cfs; however, it should be possible to maintain an overall average close to 3,100 cfs. The flow was above 3,100 cfs only 15 out of 61 days and the average flow was less than 3,000 cfs during this two month period. An extra 100 cfs could have significant operational impact to river water withdrawers and could improve instream water quality during periods of severe drought.

W. L. Payne (Bill)
Fellow Technical Advisor
Regulatory Integration & Environmental Services
Savannah River Nuclear Solutions
Savannah River Site
Building 705-3C
Aiken, SC 29808
Phone: (803) 557-9272
Email: bill.payne@srs.gov
++++++++++++++++++++++++++

Southern Environmental Law Center

The Candler Building
127 Peachtree Street, Suite 505
Atlanta, GA 30303-1800
404-521-9900
Fax 404-521-9909
selcga@selcga.org

PD

cc: DC
DE
DI
PM
OC

Fax

To: Colonel Jeffrey M. Hall

From: William Sapp

Date: 7/14/11

Fax No.: 912-652-5944.

No. of Pages (including cover page)

Comments:

If you receive this fax in error or if you encounter problems receiving this transmission, please call us at (404) 521-9900.

SOUTHERN ENVIRONMENTAL LAW CENTER

Telephone 404-521-9900

THE CANDLER BUILDING
127 PEACHTREE STREET, SUITE 605
ATLANTA, GA 30303-1840

Facsimile 404-521-9909

July 14, 2011

Via Facsimile and U.S. Mail

Colonel Jeffrey M. Hall
District Commander
U.S. Army Corps of Engineers
Savannah District
P.O. Box 889
Savannah, GA 31402-0889

Re: Flow Levels for the Savannah River

Dear Colonel Hall:

The Southern Environmental Law Center is writing this letter on behalf of the Center for a Sustainable Coast, Georgia Conservancy, Glynn Environmental Coalition, Satilla Riverkeeper, and South Carolina Coastal Conservation League to express our concerns with the Army Corps of Engineers' proposal to decrease discharges from the J. Strom Thurmond Dam (JST) from 3,600 to 3,100 cubic feet per second (cfs) during the winter should the Savannah River reservoirs experience "level 4" drought conditions. We oppose this proposal for many of the same reasons we opposed the Corps' 2010 proposal to decrease discharges from the JST to 3,600 cubic feet per second (cfs) from January 1st through February 15th, 2011, if the Corps' reservoirs on the Savannah River were to reach Level 1 or Level 2 drought conditions. Consequently, we have attached a copy of our December 30, 2010 comment letter as a component of these comments.

Additionally, we wish to point out that by independently proposing changes to its operations first for Level 1 and 2 and then for Level 4, the Corps is engaging in impermissible segmentation of the National Environmental Policy Act (NEPA) process. Thus, we request that the Corps undertake a comprehensive examination of all of its drought level contingencies on the Savannah River and incorporate this analysis in an environmental impact statement (EIS).

If the Corps has abandoned any proposal to alter its operations for drought levels 1 - 2 and has no plans to change its operations for level 3, then the current proposal should reflect those decisions. If further changes are anticipated, then this proposal should state as much. In

either case, flow changes on the Savannah of the magnitude contemplated need to be comprehensively discussed in an EIS.

Thank you for the opportunity to comment on this proposal.

Sincerely,

William W. Sapp

William W. Sapp

cc: David Kyler, Center for a Sustainable Coast
Beth Blalock, Georgia Conservancy
Daniel Parshley, Glynn Environmental Coalition
Bill Miller, Satilla Riverkeeper
Andrea Malloy, South Carolina Coastal Conservation League
Chris DeScherer, Southern Environmental Law Center

SOUTHERN ENVIRONMENTAL LAW CENTER

Telephone 404-521-9900 THE CANDLER BUILDING 127 PEACHTREE STREET, SUITE 605 ATLANTA, GA 30303-1840 Facsimile 404-521-9909

December 30, 2010

Via Facsimile and U.S. Mail

Colonel Jeffrey M. Hall
District Commander
U.S. Army Corps of Engineers
Savannah District
P.O. Box 889
Savannah, GA 31402-0889

Re: **Flow Levels for the Savannah River**

Dear Colonel Hall:

The Southern Environmental Law Center is writing this letter on behalf of the Altamaha Riverkeeper, Center for a Sustainable Coast, Glynn Environmental Coalition, Georgia Conservancy, Satilla Riverkeeper, Savannah Riverkeeper, South Carolina Coastal Conservation League, and Upstate Forever to express our concerns with the Army Corps of Engineer's proposal to decrease flows in the Savannah River during January and February of 2011. The Corps is proposing to temporarily reduce minimum flows discharged from J. Strom Thurmond Dam (JST) to 3,600 cubic feet per second (cfs) from January 1st through February 15th, 2011, if the Corps reservoirs on the Savannah River are in Level 1 or Level 2 drought conditions at that time. The environmental assessment that was written in support of the proposal states that the reduced flow period would be extended if new information indicates that shortnose sturgeon spawning would not be incrementally adversely affected.[1] After consulting with two experts on the subject, we offer the following comments in response to this proposal.

The Corps Should Employ a Watershed Approach to Managing Savannah River Flows

How the Corps manages the Savannah River water levels should be based on the overall health of the watershed.[2] The river serves many important independent and overlapping roles.

[1] U.S. Army Corps of Eng'rs, Savannah Dist., Draft Envtl. Assessment and Finding of No Significant Impact: Winter Flow Reduction Savannah River Basin (DEA), Appendix pp. 42-43 (2010).

[2] See U.S. Army Corps of Eng'rs, Policy Guidance Letter No. 61 (January 27, 1999).

In times of drought, the limits of the river to serve those roles become quite apparent. For example, unless sufficient flow is in the river to push back against the tidewaters of the Atlantic, drinking water intakes in Savannah, as well as thousands of acres of freshwater wetlands, can become overcome with saltwater. Similarly, the ability of the estuary to assimilate municipal and industrial wastes is severely tested during periods of low flow. Moreover, the Corps needs to take into account future water supply withdrawals such as those that would be required for an expanded Plant Vogtle. To protect the Savannah River, the Corps must analyze and manage this river holistically. Interests upstream should not be allowed to trump those downstream and vice versa. The Savannah River is a natural resource of tremendous value both ecologically and economically. It is ours to collectively protect or to separately ruin. If the Corps loses site of the myriad interests in the river, the latter is sure to occur.

The Corps has Insufficient Evidence to Support its Finding of No Significant Impact

The Corps has provided no data in the DEA that would support a finding of no significant impact as to fish and other aquatic organisms. In the following passage from an appendix to the DEA, the Corps admits that there is a lack of data to determine effects of the proposed reduced flows on the river's aquatic community.

> At this point, there is no correlation between discharge at the New Savannah Bluff Lock and Dam . . . gauge and water elevation within the shoals. Water depths for fish spawning and habitat have not been established. There is no correlation between discharge and water elevation/depth within the cutoff bends which may affect mussel habitat. There is also no correlation between discharge and water elevation at critical instream fish habitat.[3]

"No correlation" as the Corps uses it in this instance means that there is no data, not that there is no significant relationship.[4] It is well established in scientific literature that altered and reduced flows can result in significant negative impacts on fish and aquatic organisms.[5] Such flows can disrupt more than just the physical act of spawning in fish.[6]

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[3] U.S. Army Corps of Eng'rs, Savannah Dist., Draft Envtl. Assessment and Finding of No Significant Impact: Winter Flow Reduction Savannah River Basin (DEA), Appendices p. 45 (2010).

[4] Telephone conversation with Shawn P. Young, Ph.D., Adjunct Professor Clemson University, Dec. 28, 2010.

[5] University of Georgia River Basin Science and Policy Center, Reservoirs in Georgia: Meeting Water Supply Needs While Minimizing Impacts, 9-10 (2002).

[6] Id. at 4-5.

Flow levels and temperature regimes also provide cues for initiating migrations and physiological changes in preparation for spawning. After spawning, flow and temperature regimes have significant effects on early life stage development and survival. This holds true for the Savannah River.[7] In fact, research has indicated that the Savannah River's population of shortnose sturgeon has not benefitted by any natural recruitment in recent decades.[8] This has been attributed to loss of spawning and rearing habitat from Corps dam construction and the disruption of natural processes including altered flow regimes from Corps dam operations. The robust redhorse and other freshwater resident fish species are also in severe decline due to the same factors.

Sport Fish Should Not be Given Precedence Over Other Resources

The Corps and certain state agencies allegedly have an agreement that maintaining stable pool elevations in the reservoirs to encourage largemouth spawning should be a priority in water management decisions. In times of drought, this could mean that downstream threatened and endangered diadromous and freshwater species in the Savannah River would have to suffer at the expense of the upstream sport fish. Furthermore, a decline in endangered organisms like the sturgeon signals an overall decline in the health of the Savannah River ecosystem.

The Corps has Overestimated the Augusta Shoals Flow Levels

Discharge from JST does not properly reflect the actual flow received at the Augusta shoals, an important spawning area for fish. Under low flow conditions, the Augusta Diversion Canal, when in operation, diverts a majority of the JST discharge away from the shoals. The flow recommendations developed during the 2003 Savannah River Flow Workshop provide that a 4,000 cfs flow should be present in the shoals during January/February.[9] Under the ongoing FERC re-licensing agreement for the Augusta Diversion Canal, the shoals will only receive 1,500 cfs at this critical time of the year if this proposal is implemented. This could become a recurring problem if this approach is adopted for future years.

This will have significant impacts to fish currently using the Augusta Shoals as spawning habitat. One component of the mitigation proposed as part of the Savannah Harbor Expansion Project (SHEP) is that the Corps would install a fish passage structure at the New Savannah Bluff Lock and Dam (NSBL&D). The intent of this structure would be to allow diadromous and freshwater fish to gain access to the shoals for spawning. In light of this, it is imperative that the shoals receive appropriate flow both during the January to February period to stimulate

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[7] See generally, Duncan, William W., et al. CONSIDERATIONS FOR FLOW ALTERNATIVES THAT SUSTAIN SAVANNAH RIVER FISH POPULATIONS. 2 (2003).

[8] Shawn Young, supra at n. 4.

[9] DEA Appendices, p. 58.

migration upriver and during the March to May period to allow spawning in the shoals. This amount is likely to prove to be far more than the 1,500 cfs that the proposed plan would afford them.

In recent years, the Corps has implemented flow reductions similar to the one proposed here. It is likely that the Corps will propose similar actions in the future as pressure on water resources increases. This leads to the necessity for the Corps to adopt a strict flow schedule that prioritizes the needs of diadromous and freshwater fish below Corps facilities on the Savannah River and to explore alternative actions instead of simply reducing flows from JST to offset storage loss in the reservoirs. If the shoals do not receive sufficient water, it will be even more difficult for the SHEP mitigation to provide benefits to shortnose sturgeon.

The Corps Should Follow the Drought Management Plan or Amend It

The current drought management plan (DMP) exists for a reason: to guide the actions of the Corps in times of reduced rainfall. The Plan is designed to serve as the Corps guide until the Corps formally re-writes the Water Operations Manuals. Early in 2011 the Corps will commence work on the Phase II Basin Study, which will include detailed analysis of drought effects and potential new drought response scenarios. This study should be completed and the results of it should be analyzed before changes are made to the flow levels. The Corps should stop relying on temporary deviations from the DMP during minor periods of reduced rainfall. This does not comport with the Water Operations Manuals.[10] The step-downs in flow in the current DCP are structured to balance the Corps's authorized uses. By arbitrarily eliminating these step-downs, the Corps has assumed the authority to tip the balance in favor of one use (recreation/sport fish) over other uses. This is especially problematic when recreation levels are at their lowest levels during the January/February period.

January and February are Critical Months for Fish Movement

While January is not a critical time for sport fish in the reservoirs, it is a critical time for diadromous fish located below the Corps dams. As stated above, this is the period where higher winter-spring flows trigger fish to start migrating upstream. Telemetry data on sturgeon in the Savannah have confirmed this relationship between higher flows and migration. In light of the importance of flow to sturgeon migration and the impacts that flow modifications may have on this species, the Corps is required under the ESA to complete a biological assessment for the shortnose sturgeon and seek concurrence from National Marine Fisheries Service before issuing a final FONSI for this proposed action. Outside of the March to May spawning season, the January to February period is probably the most important time to deliver flow down the Savannah River for migrating fish populations. Only in true drought situations should flow restrictions be considered during this period.

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[10] Id.

Timing of Public Comment Period

Finally, we request that the Corps refrain from releasing proposals for significant projects over holiday periods. Just recently the Corps released the Draft Environmental Impact Statement for the Savannah Harbor Expansion Project at such a time that the public comment period extended over both the Christmas and New Years holiday period, and now the Corps has released this DEA for a 15 day period over the same holiday period. For the public and for other government agencies, this effectively cuts the comment period in half. Comment periods have been established to provide adequate time for the public and other government agencies to weigh in on important projects. No government project is so important that outside input should be unnecessarily shortened.

Thank you for the opportunity to comment on this proposal.

Sincerely,

William W. Sapp

cc: Sonja Cox, Altamaha Riverkeeper
David Kyler, Center for a Sustainable Coast
Will Berson, Georgia Conservancy
Daniel Parshley, Glynn Environmental Coalition
Bill Miller, Satilla Riverkeeper
Tonya Bonitatibus, Savannah Riverkeeper
Dana Beach, South Carolina Coastal Conservation League
Chris Descherer, Southern Environmental Law Center
John Tynan, Upstate Forever

South Carolina Department of
Natural Resources

1000 Assembly Street Suite 336
PO Box 167
Columbia, SC 29202
803.734.3766 Office
803.734.9809 Fax
perryb@dnr.sc.gov

John E. Frampton
Director
Robert D. Perry
Director, Office of
Environmental Programs

July 14, 2011

Mr. Larry Olliff
Planning Division
US Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, GA 31401-3640

REFERENCE: Draft Environmental Assessment and Draft Finding of No Significant Impact Drought Contingency Plan Modification for the Savannah River

Dear Mr. Olliff,

Please be advised personnel of the South Carolina Department of Natural Resources (DNR) have reviewed the June 2011 Draft Environmental Assessment (Draft EA) and Draft Finding of No Significant Impact (Draft FONSI) for a proposed modification to the US Army Corps of Engineers *1989 Savannah River Basin Drought Contingency Plan* (SRBDCP) on the Savannah River in Georgia and South Carolina.

The proposed action would consist of refining the SRBDCP for drought Level 4 operations during extreme drought periods when the conservation pools of Lakes Hartwell, Russell and Thurmond have been exhausted and discharges must be made from the inactive pools. The objective of the proposed change is to conserve reservoir storage when it is critical to do so.

Drought Level 4 conditions presently require Lake Thurmond discharge to the Savannah River at 3,600 cfs for as long as possible before transitioning to a daily average outflow equal to net daily average inflow. The proposed action would adjust the daily average release from Lake Thurmond from 3,600 to 3,100 cfs in drought Level 4 conditions from November through the end of February, before transitioning to daily average outflow equals daily average inflow when the pools reach the bottom of inactive storage. Operations would be restored to flows of up to 3,600 cfs per day if requested by either of the states of South Carolina or Georgia.

Based on the information provided in the Draft EA and Draft FONSI, DNR supports the proposed modifications to the SRBDCP.

Thank you for the opportunity to comment on this issue. Please do not hesitate to contact me if any additional information will be required in order to properly address this issue.

Very truly yours,

Bob Perry
Director, Office of Environmental Programs

c: F. Allen Barnes – GA DNR EPD
Linda MacGregor – GA DNR EPD
Jeff Larson – GA DNR
Brad Gane – GA DNR-CRD
Barbara Neale – SC DHEC-OCRM
Rheta DiNovo – SC DHEC-OCRM
Blair Williams – SC DHEC-OCRM
David Wilson – SC DHEC
David Baize – SC DHEC
Larry Turner – SC DHEC
Heather Preston – SC DHEC
Jay Herrington – FWS
Pace Wilber – NMFS
John Frampton
Don Winslow
Ken Rentiers
Joe Gellici
Hope Mizzell
Robert Boyles
Breck Carmichael
Ross Self
Lynn Quattro

Georgia Department of Natural Resources
2 Martin Luther King Jr. Dr., S.E., Suite 1152 East, Atlanta, Georgia 30334-9000
Mark Williams, Commissioner
F. Allen Barnes, Director
Environmental Protection Division
404/656-4713

July 13, 2011

Mr. Larry Olliff
PD, U.S. Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640

Subject: Savannah River Basin Level 4 Drought Operations

Dear Mr. Olliff:

This letter responds to the U.S. Army Corps of Engineers, Savannah District's request for comment concerning the June 2011 Draft Environmental Assessment and Finding of No Significant Impact, Level 4 Drought Operations, Savannah River Basin (EA). The purpose of the EA is to propose a change in the operational rules of the Corps' Savannah River reservoir system during extreme drought periods.

Specifically, the change only involves the operation of the reservoirs during drought Level 4 in which the reservoir system's conservation storage is depleted, and releases must be made from the inactive storage. The EA proposes to reduce the daily average discharge from the J. Strom Thurmond Reservoir from 3,600 to 3,100 cubic feet per second (cfs) during the period from November 1st through February 28th during drought Level 4. Furthermore, the proposed change allows for reservoir releases to be increased up to 3,600 cfs at the request of the States of Georgia and South Carolina, and NOAA-Fisheries if certain performance targets are not achieved. Such releases would be maintained as long as possible after which time outflow flow would be limited to net inflow. The objective of this change is to conserve the remaining storage in the system's reservoirs for their intended uses.

The State of Georgia supports the findings of the EA, and approves of the change to reservoir release rates in the Savannah River reservoir system during drought Level 4. We appreciate the opportunity to review and comment on the Draft EA.

Sincerely,

F. Allen Barnes
Director

LAKE HARTWELL ASSOCIATION, INC.
P.O. Box 2122 • Anderson, SC 29622
Phone: 1-864-224-5253 • www.lakehartwellassociation.org

July 13, 2011

Colonel Jeffrey M. Hall
US Army Corps of Engineers
P. O. Box 889
Savannah, GA 31402-0889

Re: SRB Drought Contingency Plan Refinement, Request for Comments dated June 16, 2011.

Dear Colonel Hall:

The Lake Hartwell Association cannot endorse the recommended changes as defined in the *Draft Savannah River Basin Level 4 Drought Operations Study Environmental Assessment (EA)* nor do we agree with the *Draft Finding of No Significant Impact (FONSI)*, as stated in the document. If water levels drop anywhere close to Drought Level 4 there is a very high probability of a significant impact to the people using water from Hartwell Lake. **One of the most significant impacts could be an impaired quality of water creating a potentially dangerous health situation for many thousands of users.** This possibility requires a detailed technical analysis of Hartwell Lake water issues at Drought Level 4. Many steps can be taken at earlier drought levels to greatly reduce or eliminate this possibility.

LHA understands the reasoning for having Environmental Assessments (EAs) in place before specific drought levels are reached. It is an expedient way to operate. **Unfortunately, by the time Drought Level 4 is reached, as defined by your proposal, Hartwell Lake will be 35 feet below full pool. The last major drought, one from which we have only recently recovered and which caused serious economic damage by devastating recreation and real estate activities around our nearly 1000 miles of shoreline, was the lowest ever experienced at 22 feet below full pool. It is difficult to imagine the damage that Level 4 would cause**. In addition to potentially impaired water quality, many of the businesses such as marinas, dock builders and the like, some of which have been serving the lake's recreational users for decades, would be forced out of business. A number of these businesses were forced to close as a result of the last drought. **Recreation is, after all, a Corps mandate.**

We have been assured numerous times that the Corps would become more adaptive in managing droughts based on lessons learned from previous drought experiences, and would make every effort to keep the lakes as full as possible. Water in the lakes is an asset, and like money in the bank, is available for use if needed for downstream emergencies. Once released, however, the water is gone and is no longer available.....period. **We are asking that the Corps begin thinking adaptively now as we are already experiencing drought conditions in both states, and the above average heat in the Southeast has increased the demand for electrical energy. If flows of 3100 cfs satisfy downstream needs at Drought Level 4 during the cooler months of November through February, then they should be adequate beginning at Drought Level 1. In addition, should Drought Level 3 occur, out-flows should not exceed in-flows, in order to prevent a Level 4 situation.**

On behalf of the more than 2000 family, organizational, and business members of the Lake Hartwell Association, we request a full Environmental Impact Statement (EIS) to assure the results you have indicated are absolutely correct; and to possibly suggest other alternative measures that, together with lessons learned from previous droughts, would aid in avoiding potentially hazardous lake levels.

We also urge you to consider improved processes to reduce flows at Drought Levels 1, 2 and 3 and strongly recommend, that should Drought Level 3 be reached, out-flows should not exceed in-flows, in order to avoid a Level 4 situation. We encourage the Corps to act now to have EAs permanently in hand to ensure that these measures can be implemented in a timely and aggressive manner until such time as a more acceptable and conservative permanent Drought Management Plan is approved and implemented.

Thank you in advance for considering our recommendations for conserving and protecting our magnificent Savannah River Basin lakes.

Sincerely,

Herb Burnham, President
Lake Hartwell Association

From: Harry Shelley
To: CESAS-PD, SAS
Subject: RE: EA modification to the 1989 SRBDCP
Date: Wednesday, July 13, 2011 10:21:53 PM
Attachments: LowFlow Response 2011.doc
LowFlow Response 2011.pdf

Planning Department: Attached please find Word and PDF document files with the Friends of the Savannah River Basin response comments concerning the subject EA. We thank you for the opportunity to respond.

Regards,
Harry Shelley

US Army Corps of Engineers
Attn: PD, Savannah District
Savannah, Georgia 31402-0889

RE: Modification to the US Army Corps of Savannah River Basin Drought Contingency Plan (SRBDCP) on the Savannah River in Georgia and South Carolina.

Dear Planning Department:

The Friends of the Savannah River Basin (FSRB) appreciates the opportunity to respond to the Environmental Assessment (EA) and Draft Finding of No Significant Impact (FONSI) for a modification to the US Army Corps of Engineers' Savannah River Basin Drought Contingency Plan (SRBDCP) on the Savannah River in Georgia and South Carolina.

The proposed action, as summarized in the Joint Public Notice, consists of a modification to the 1989 SRBDCP to reduce average daily releases from J. Strom Thurmond (JST) Dam from 3,600 to 3,100 cubic feet per second (cfs) during a colder period, when the Corps' reservoirs on the Savannah River are in Level 4 drought conditions.

The FSRB has previously and continues to support proactive efforts between the States of Georgia and South Carolina, the Army Corps of Engineers, and other Federal Agencies to aggressively manage the water resources to maintain conservation pools at the highest possible levels while protecting downstream water needs and resources. However the FSRB believes that this EA should either be postponed or determined to have significant impact. We cannot support its implementation in the current form.

Our determination is based on the following factors:

- The Joint Public Notice makes no mention that the EA also contains a previously unseen description of the operation of the Lake system when in Level 4. This analysis of this critical situation (using the inactive storage of each lake) has long term impacts and consequences that cannot and should not be judged alone but only as part of the impending drought plan study. Any analysis requires far longer than a standard 30 day response and major participation by the States and basin stakeholders.
- The operational concept contained in the EA would allow the extreme lowering of the Lakes and continued operation in the inactive storage domain. As a result major impacts to water users, industry, municipal water supplies, private property owners, wildlife are inevitable thereby requiring a full Environmental Impact Statement. It is also unclear how long lasting are these effects when conditions improve.
- There is confusion about what is the general operational concept should the lakes conservation pools ever be exhausted. The general consensus is that it is output=input. It is recognized that the Action Level Table in the 1989 Drought Plan states: *continue Level 3 discharge as long as possible, thereafter Outflow = Inflow*. However Table 8: Hartwell and Thurmond Action Levels for Alternative 2 in the 2006 Drought Level EA states for level 4: *Daily Average Outflow = Daily Average Inflow*.
- The discussion of operation in Level 4 is inconsistent with two of the objectives of Drought Management in the 1989 plan:
    - *The reservoir levels should not be drawn below the bottom of the conservation pool*

- *Make use of most of the available storage in the reservoirs during the drought-of-record. They should not be drawn down entirely, though, as a contingency against a drought that exceeds the drought of record.*

- There has been enough change and/or deviations in the 1989 Drought Plan that a total rewrite should be done to eliminate any ambiguities and uncertainties. This is what the States have requested in the impending study.
- The EA only provides "lip service" to the request from the states in the 2006 EA: *The water users should identify ways (e.g. local engineering measures) of avoiding or mitigating impacts of such flow reduction and communicate such measures as well as the costs of such measures to the Corps and the States.*
- In the discussing the relationship to ongoing actions, the section on Savannah Harbor does not fully address the many concerns that have been submitted as part of the SHEP EIS. Also there is no discussion of the impact of the significant reduction in the DO TMDL in the lower river required by the EPA (this could potentially help mitigate the impact of lowered DO in the warmer months and support lower flows).
- The EA does not supply any data that addresses whether there are any public health issues concerning the releasing of inactive storage water down the Savannah River and the overall water quality of these releases.
- The EA dismisses the alternative of output=input with one short paragraph delineating a list of general impacts with no analysis.
- The EA uses an assumed 50-50 approximation for the diversion into the Augusta Canal affecting flows to the environmentally sensitive upper portion of the shoals. The pending FERC license agreement has not yet been approved and the Corps has no way to force this.

The last three droughts have each been a new drought of record. The most recent drought that began in 2006 caused the Lakes to drop faster than any previous drought of record. It is clear that significant changes in the Drought Management need to be made and lessons learned institutionalized. This includes a comprehensive reassessment of the actions taken early in a drought condition given the catastrophic consequences to the entire SRB of getting to an inflow equals outflow condition.

The FSRB is not against developing a comprehensive plan to determine what would happen should the Lakes approach the bottom of their conservation pools. This has been requested since 1989 and the States requested it again in 2006. However with an issue of this magnitude it cannot be done by a simple EA without the examination of the entire contingency planning including the definition of mandatory steps by the Corps and the States to decrease the probability of occurrence to a level so as to preclude it ever happening. We look forward to working towards a comprehensive update of the Drought Contingency Plan including aggressive proactive management early in the drought.

Friends of the Savannah River Basin
Barb and Harry Shelley
Facilitators

Note: The EA has several administrative comments that are included in the Appendix for info only.

Appendix
Administrative Comments

- Table 7: apparent errors in conversion of days to years conversion in last 6 entries
- Table 8: apparent errors in conversion of days to years for most of the entries
- Para 4.9 Hartwell Lake: Typo in 2nd to last sentence Hartwell spelled wrong
- Para 4.9 JST Lake: Cut and paste error in 2nd to last sentence: Copied misspelling of Hartwell into JST paragraph

From: Jamie Higgins
To: Bailey, William G SAS
Cc: higgins.jamie@epa.gov; Heinz Mueller
Subject: Draft EA/FONSI Level 4 Draft Operations Savannah River Basin
Date: Thursday, July 14, 2011 4:02:09 PM
Attachments: savannah drought level 4 EA-July 14, 2011 EPA Comments.docx

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Hi Bill,
I hope you are doing well these days! Anyway, I am the Primary NEPA Reviewer for the Draft EA for the Level 4 Draft Operations Savannah River Basin. Below and attached are my comments on the EA. Please let me know if you have questions regarding my comments. Since we are giving you our comments informally (via email), I ask that you include our comments in the Final EA/FONSI as well as any responses to our comments. Thanks for the opportunity to review the document. I look forward to working with you again in the future!

Jamie

Jamie Higgins
EPA, Region 4
NEPA Office

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Draft Environmental Assessment and Finding of No Significant Impact
Level 4 Draft Operations Savannah River Basin
July 14, 2011

U.S. Environmental Protection Agency Advisory Comments:

1. On page 38, (2.12. HTRW), the term "HTRW" is a term specific only to the Corps of Engineers' vernacular and could be confusing for the average citizen. EPA recommends that Savannah District spell out this acronym as "Hazardous Toxic Radioactive Waste".

2. The Corps discusses an "extensive collaboration" with other state and Federal resource agencies (page 39, 3.1 Alternative Formulation). What is the extensive collaboration initiative that the Savannah District that is referenced? What state and Federal agencies, non-profit organizations and businesses groups were represented in this collaborative effort? Is this collaborative effort still active? Since the Corps is relying on this initiative to base the assumption that the Federal and state resource agencies are supportive of the proposed action, then the Corps should briefly describe this program to include member representatives and findings. EPA recommends the Corps describe and document either within the body of the EA or an appendix the composition, mission and any pertinent findings of this

collaborative effort.

3. The Corps states that the State agencies are supportive of the reduction in wintertime flow (page 51, 3.2.2. Alternative 1, first paragraph). What state agencies are supportive of this action? Appendix G (Georgia Department of Natural Resources Environmental Protection Division Summary of Findings 2008 3100 CFS Discharge, dated June 22, 2009) refers to findings by Georgia EPD, South Carolina DHEC and South Carolina DNR. EPA recommends that the Corps reference Appendix G in the 3.2.2. Alternative 1 section of the EA. Also, is the Georgia Wildlife Resources Division (WRD) supportive of the preferred Alternative? If so, this should be documented within the EA and supported by written communication. EPA recommends that the Corps discuss the disposition of the Georgia WRD within the text of the EA.

4. The Corps discusses the member composition Savannah River Basin Drought Coordination Committee (SRBDCC) (page 51, 3.2.2. Alternative 1, first paragraph); however, no mention was made of the U.S. Fish and Wildlife Service (USFWS) or NOAA-National Marine Fisheries Service (NFMS). Table 14: Offices Representing Agencies lists different agencies, but there is no mention of Georgia WRD or USFWS. Given the sensitive nature of the estuary habitats (including the Savannah National Wildlife Refuge) and endangered species, it would seem important to include these resource agencies on any drought operations decisions. EPA recommends that USFWS, NMFS and Georgia WRD be invited to participate on the SRBDCC. If these agencies have been invited to participate and have declined participation, then the Corps should explain their attempts to include these agencies in the body of the EA.

5. The Corps discusses impacts to the Augusta shoals in relationship to the Augusta Canal and reduced flows stating, "The amount of flow reduction is expected to result in minor effects to those biotic communities (page 72, Effects of Recommend Alternative, third paragraph)." The Corps anticipated a reduction of 250 CFS (from 450 CFS, which would be 200 CFS or a 44% decrease in flow) over the Augusta Shoals. The Corps claims that this would not adversely affect anadromous species because the species would unlikely be within the shoals during the winter months when flows are proposed to be reduced. There is no discussion in the EA as to the USFWS, NFMS, SCDNR or GADNR's opinion on the impacts of this 44% decrease in flow over the Augusta Shoals. EPA recommends that the Corps consult with USFWS, NFMS, SCDNR AND GADNR regarding the potential impacts to the Augusta Shoals. EPA further recommends that a discussion be added to the Effects of Recommended Alternative section and explain the views of these resource agencies.

6. The Corps briefly discusses the Savannah National Wildlife Refuge (NWR) in 4.5 Biotic Communities-Estuary (page 75) section of the EA; however, there are no specific impacts discussions mentioned in the Effects of Recommended Alternative sections. What are the potential impacts of the reduction of flow? Has the Corps consulted with the USFWS regarding impacts to Savannah NWR? If so, is the USFWS supportive of the decreases? EPA recommends that the Corps consult with the UFWS regarding potential impacts to the NWR. Additionally, EPA recommends that the Corp include a more thorough discussion of potential impacts to the NWR as well as discuss the USFWS views (positively or negatively) toward the preferred alternative.

7. The Corps states that "...439 acres of freshwater marsh could undergo temporary adverse effects due to higher salinity as a result of

Alternative 1." Are the 439 acres all in the Savannah NWR and if not, where are these 439 acres and who are the land owners? As with the previous comment, if these marshes are located in the Savannah NWR, EPA recommends the Corps consult closely with the USFWS (as well as other land owners) as well as the Georgia Coastal Resources Management Division and include their concerns in the discussion of the EA.

8. The Corps has made the determination that the preferred alternative "may affect, but not likely to adversely affect the shortnose sturgeon, manatee and wood stork. (page 83, Effects of Recommended Alternative)." It appears that the USFWS concurred with the Corps effects determination (reference USFWS letter dated June 4, 2009, Savannah River flow recommendations below Thurmond Dam FWS Log No. 41460-2009-FA-0650). Given that this determination is over 2 years old, does the Corps intend to consult with the USFWS? EPA recommends that the Corps engage the USFWS to ensure that there are no new listed species in the affected area and ensure conditions for previously listed species have not changed. Also, as noted in the USFWS letter dated June 4, 2009, the shortnose sturgeon falls under the authority of the NFMS; however, there is no written concurrence from NFMS regarding the shortnose sturgeon. There is a NFMS letter included in the supporting documentation (letter dated June 24, 2009), but it is unclear if this is an effects determination concurrence letter. Section 7 of the Endangered Species Act and ER 1105-2-100, Appendix C, (page C-8) requires the written concurrence from USFWS or NFMS (as appropriate) regarding any "may affect, not likely to adversely affect" determinations. Again as with the USFWS determination letter, EPA recommends that the Corps contact the NFMS to ensure that there are not other listed species in the affected area and receive written concurrence from NFMS regarding the Corps' effects determination. Additionally, EPA recommends that any supporting documentation be referenced in the body of the EA.

9. The USFWS letter dated June 24, 2009 states, "In light of these concerns, and without our critical research needs addressed, we do not recommend a flow reduction to 3,100 cfs. Both the long duration and timing of the protracted period would be of concern. Additionally, if implemented in 2009, the proposed reduction would be in addition to recent long-term, low-flow conditions, which could exacerbate environmentally stressful conditions and amplify otherwise negligible biological impacts." It appears that none of the USFWS concerns were addressed in the EA. Does the Corps intend to mitigate for any of these habitat loses? EPA recommends that the Corps fully disclose the USFWS concerns in the EA as well as work closely with USFWS and NFMS to mitigate habitat losses due to reduced flow.

10. The Corps doesn't discuss the impacts regarding sports fishing downstream of the Thurmond in 4.8 Recreation (page 84). Will reduced flows impact sport fishing? EPA recommends discuss any impacts to fishing downstream of the dam in the EA.

11. It appears that the Corps has made a determination that the preferred alternative is consistent with Coastal Zone Management Act (CZMA) state plans; however, there is no supporting documentation (written concurrence) that the states of Georgia and South Carolina have concurred with their determination. EPA recommends that the Corps engage the states of Georgia and South Carolina to ensure the preferred action is consistent with their respective CZMA plans. Additionally, EPA recommends a more robust discussion regarding the state of Georgia and South Carolina's recommendations regarding coastal zone impacts.

12. There is no socio-economic impacts discussion within the EA. The preferred alternative could possible increase or help sustain economic impacts within the lakes. The higher lake levels would encourage and sustain recreation, which are important economic drivers in local communities. Also, what are the economic impacts to businesses downstream of the lake. For example, will reduced flows impact industrial plants and other businesses such as the Vogtle Power Plant that relies on adequate water for operational withdrawals? Will the reduce flow impact businesses that have NPDES permits that might have to reduce discharges to meet state water quality standards? It would appear that reducing flow could have both positive and negative impacts to local businesses that rely upon the Savannah River system. EPA recommends that the Corps conduct a thorough socio-economic analysis regarding the preferred alternative's impacts to the local communities impacted.

13. The Corps does not discuss Climate Change in the EA. CEQ recently released draft guidance (Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions, dated February 18, 2010, http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf) requesting agencies to consider conducting climate change analysis within the NEPA process. The purpose of the guidance is to encourage Federal Agencies to, "(1) The GHG emissions effects of a proposed action and alternative actions; and (2) The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation and adaptation measures."

A climate change discussion could assist the Corps in justifying the need for reduce flow during times of drought. In fact, the proposed action could be viewed as an adaptive measure for addressing ever increasing drought conditions resulting from climate change. EPA recommends that the Corps discuss climate change relating to the proposed federal action.

(See attached file: savannah drought level 4 EA-July 14, 2011 EPA Comments.docx)

D H E C
PROMOTE PROTECT PROSPER

July 14, 2011

Mr. Larry Olliff
ATTN: PD, U.S. Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640

RE: SC Department of Health & Environmental Control Comments
Draft Environmental Assessment and Finding of No Significant Impact
Level 4 Drought Operations, Savannah River Basin

Dear Mr. Olliff:

This letter is in response to the Savannah District, Corps of Engineer's request for comments on the referenced Environmental Assessment. The proposed action consists of refining the 1989 Savannah River Basin Drought Contingency Plan for drought Level 4 operations during extreme drought periods when the conservation pools of Lakes Hartwell, Russell and Thurmond have been exhausted and discharges must be made from the inactive pools.

Drought Contingency Plan provisions for Level 4 conditions currently call for maintaining the discharge to the Savannah River from Lake Thurmond at 3,600 as long as possible before transitioning to a daily average outflow equal to net daily average inflow. The preferred alternative under Level 4 conditions is to maintain the 3,600 cfs discharge for the months of March through October and to reduce flows to 3,100 cfs from November 1 through February 28. The modified Drought Contingency Plan would include provisions to allow the states of South Carolina and Georgia and NOAA Fisheries to request a return to 3600 cfs discharge from Lake Thurmond if certain system performance targets are not met. Under Level 4 Conditions, the 3,600 cfs/3,100 cfs flow regime would be maintained as long as possible before transitioning to daily average outflow equal to net daily average inflow. The objective of the proposed change is to conserve the remaining storage in the system's reservoirs for as long as possible.

Based on the information provided in the Environmental Assessment, the South Carolina Department of Health and Environmental Control supports the proposed modifications to the 1989 Savannah River Basin Drought Contingency Plan. Also, the Department's Office of Ocean and Coastal Resource Management concurs with the finding of consistency with the SC Coastal Zone Management Program.

Thank you for the opportunity to review and comment on the Draft EA. We look forward to working with you on important issues dealing with management of the Savannah River Reservoir system.

Sincerely,

David E. Wilson, Jr. PE
Bureau Chief
Bureau of Water

cc: Rheta Dinovo, SCDHEC: OCRM
Ken Rentiers, SC DNR
Linda McGregor, GA EPD

Olliff, Larry B SAS

From: Bailey, William G SAS
Sent: Wednesday, July 13, 2011 3:55 PM
To: Olliff, Larry B SAS
Cc: Morris, Jeffrey S SAS; Simpson, Stanley L SAS; Ward, Jason M SAS
Subject: FW: Level 4 Drought Operations EA (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

From: Paul A Conrads [mailto:pconrads@usgs.gov]
Sent: Wednesday, July 13, 2011 3:29 PM
To: Bailey, William G SAS
Cc: Hoke, Joseph T SAS; Simpson, Stanley L SAS; Eric W Strom
Subject: Level 4 Drought Operations EA

Bill,

I read over the EA and the preparers did a good job of compiling the important data on potential resource impacts of the modification to the Drought Contingency Plan. I was glad to see that the M2M was of utility to evaluate marsh impacts. I wanted to bring to your attention that in our recent report on analysis of chloride concentration in Abercorn Creek there is a scenario evaluating impacts of reduce winter flows on chloride concentrations at the City's intake. I reduced flows to 3,600 cfs at Clyo (assuming 500 cfs of intervening flow between Augusta and Clyo) and simulated 3 years of chloride concentrations at the intake. The results of the scenario similar to the analysis presented in the EA. If you are interested in the report and scenario (pg. 33-35), it is available online: http://pubs.usgs.gov/sir/2011/5074/ <http://pubs.usgs.gov/sir/2011/5074/> .

Take care,

Paul

Paul Conrads
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Classification: UNCLASSIFIED
Caveats: NONE

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
HISTORIC PRESERVATION DIVISION

MARK WILLIAMS
COMMISSIONER

DR. DAVID CRASS
DIVISION DIRECTOR

MEMORANDUM

TO: Larry Olliff
Attn: PD
US Army Corps of Engineers
Savannah District
100 West Oglethorpe Avenue
Savannah, Georgia 31401-3640

FROM: Elizabeth Shirk
Environmental Review Coordinator
Historic Preservation Division

RE: Finding of "No Historic Properties Affected"

PROJECT: **JPN: Deviate from 1989 Savannah River Basin Drought Contingency Plan**
Federal Agency: COE
HP-091005-002

COUNTY: Statewide

DATE: July 11, 2011

The Historic Preservation Division (HPD) has reviewed the information received concerning the above-referenced project. Our comments are offered to assist federal agencies and their project applicants in complying with the provisions of Section 106 of the National Historic Preservation Act, as amended.

Based on the information submitted, HPD has determined that no historic properties or archaeological resources that are listed in or eligible for listing in the National Register of Historic Places will be affected by this undertaking. Please note that historic and/or archaeological resources may be located within the project's area of potential effect (APE), however, at this time it has been determined that they will not be impacted by the above-referenced project. Furthermore, any changes to this project as proposed will require further review by our office for compliance with Section 106.

If we may be of further assistance, please do not hesitate to contact Erin Parr, Environmental Review Specialist, at (404) 651-6546. Please refer to the project number assigned above in any future correspondence regarding this project.

ES:mcv

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From:	Alice_Lawrence@fws.gov
To:	Bailey, William G SAS
Cc:	Jay_Herrington@fws.gov; Thomas_McCoy@fws.gov; Mark_Caldwell@fws.gov; Amanda_Hill@fws.gov; Jane_Griess@fws.gov; Chuck_Hayes@fws.gov; Bill_Wikoff@fws.gov; Strant_Colwell@fws.gov; Deborah_C_Harris@fws.gov; Tamara_Johnson@fws.gov; Mark_A_Cantrell@fws.gov; stephania.bolden@noaa.gov; pace.wilber@noaa.gov; smtp-Brownell, Prescott; ed.betross@dnr.state.ga.us; Sandy_Tucker@fws.gov; will_duncan@fws.gov
Subject:	Service comments regarding the June 2011 Draft EA and FONSI for Level 4 Drought Operations for the Savannah River Basin
Date:	Wednesday, July 13, 2011 12:59:08 PM
Attachments:	USFWS Comments on Savannah July 2011 EA FONSI Draft 7_13_2011.pdf

Here are our comments on the June 2011 Draft EA and FONSI for Level 4 Drought Operations for the Savannah River Basin. Please let us know if you have questions- thanks. Alice

Alice P. Lawrence
Fish and Wildlife Biologist
United States Fish and Wildlife Service
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United States Department of the Interior
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4980 Wildlife Dr.
Townsend, Georgia 31331

July 13, 2011

Colonel Jeffery M. Hall
District Engineer
Savannah District, Corps of Engineers
P.O. Box 889
Savannah, Georgia 31402-0889

Dear Colonel Hall:

Thank you for the opportunity to review the June 2011, Draft Environmental Assessment (Draft EA) and Finding of No Significant Impact (FONSI) for a permanent modification to the U.S. Army Corps of Engineers (ACOE) 1989 Savannah River Basin Drought Contingency Plan (DCP) for ACOE projects on the Savannah River in Georgia and South Carolina during Drought Level 4 operations. The United States Fish and Wildlife Service (Service) submits the following comments on the project under provisions of the Fish and Wildlife Coordination Act (FWCA) (44 Stat. 401, as amended. 16 U.S.C. 661 et seq.) and the Endangered Species Act (ESA) of 1973 as amended (16 U.S.C. 1531 et seq.).

In the Draft EA, the ACOE considered three alternatives including the selected Alternative 1, as described below:

a. No Action Alternative: Continue with the March 1989 Savannah River Basin DCP, as updated in 2006, which includes a discharge of 3,600 cubic feet per second (cfs) after Drought Level 4 is reached to be maintained as long as possible, then further reduced where the outflow from the lakes equals the net inflow.

b. Alternative 1: Retain the major components of the 1989 DCP, but adjust the minimum daily average release at J. Strom Thurmond Dam (JSTD) to 3,100 cfs for the period of November 1st through the end of February while in Drought Level 4 conditions.

c. Alternative Considered but Eliminated from Detailed Consideration. Discharge at a rate where outflow equals inflow beginning when the reservoir pools are at the bottom of their conservation storage. This alternative was determined by ACOE to have unacceptable adverse impacts downstream of JSTD to threatened and endangered species, water quality, and water supply.

The Service objects to the alternatives that were developed and the proposed implementation of Alternative 1. Our concerns and objections pertaining to the Draft EA are outlined below.

ACOE management actions based on trigger elevations of reservoir levels

ACOE links management actions pertaining to drought operations to specific reservoir elevations, referenced as Levels 1-4, that act as triggers. It is unclear how these specific elevations were selected. For instance, Level 4 elevations do not seem to be correlated to physical operating constraints of the reservoirs. Because ACOE is proposing reduced downstream flows based on what seem to be arbitrarily selected reservoir levels, we recommend ACOE be clear about how these specific elevations were selected and justify their use.

Drought operations should not be solely based on reservoir levels. For example, ACOE operations in the Apalachicola-Chattahoochee-Flint (ACF) Basin and the Alabama-Coosa-Tallapoosa (ACT) Basin are not based on reservoir levels alone. Instead, drought operations should be based on triggers that include reservoir level thresholds, basin inflow, and climatic thresholds. Using only reservoir storage does not necessarily tie operations directly to drought conditions. For instance, water consumption, interbasin transfers, and/or ACOE hydropower operations could draw down storage levels instead of true drought conditions. We recommend ACOE modify their drought operations triggers, and establish procedures for reductions in water use during periods of low inflow to ACOE and other reservoirs in the basin. These procedures should be developed on the basis that all parties with interests in water quantity will share the responsibility to establish priorities and to conserve the limited water supply. Such a set of procedures would establish trigger points and procedures for how the reservoirs will be operated; as well as, water withdrawal reduction measures and goals for other water users during periods of low inflow (i.e., periods when there is not enough water flowing into the reservoirs to meet the normal water demands while maintaining usable storage in the reservoir system at or above a seasonal target level).

The Draft EA states that when the reservoirs reach the Level 1 trigger elevation, ACOE issues a public safety advisory concerning recreational use of the reservoirs. As a similar action, we recommend that when the reservoirs reach Levels 1-4 that ACOE also issue public advisories regarding the status of the reservoir levels and the need for the public to engage in reduced water consumption.

Alternatives analysis needs further development and evaluation

The alternatives analysis provided in the Draft EA included a no action alternative and the proposed action alternative that would reduce discharge from JSTD by approximately 14%. Although we recognize that a Drought Level 4 situation represents extreme and rare conditions, we emphasize to ACOE that this is the fifth occasion since late 2008 that ACOE has proposed to reduce discharges. The Service objected to previous discharge reduction proposals because of the anticipated levels of adverse impacts to downstream resources. Potential impacts to downstream ecosystems are associated with each proposed flow reduction - these ecosystems have already been severely impacted or geographically limited by anthropogenic factors. Thus, we emphasize that any change to the DCP should include a proposed action alternative that

reduces impacts to downstream environments less than the currently proposed action alternative. Measures to consider should include early water conservation, re-siting or modification of water intakes to prolong their use as reservoir levels recede, alternative operational strategies to ensure shoal and Savannah NWR freshwater inflows, and adequate discharge to ensure and maintain habitat for downstream species.

In the description of the proposed action and alternatives analysis, the Draft EA states, "the 2008 EA determined that it is possible to release as little as 3,100 cfs under specific conditions with an acceptable level of impact." Our subsequent correspondence with the ACOE provided direct evidence to the contrary. The flow reduction in 2008 severely reduced shoal inflow for large portions of the river shoal habitats for prolonged periods. The ACOE has not provided any additional details about this alternative to indicate that the system will be managed in a manner that ensures shoal inflow during this proposed flow reduction, making this alternative unacceptable.

The analysis in the Draft EA examined the effects of the proposed and no action alternatives on storage depletion if 2008 inflows were encountered repeatedly over a 9-year period. Multiple consecutive years of extremely reduced flows could have potentially devastating impacts on population sizes of early spring spawning species (including shortnose and Atlantic sturgeon). However, if a flow reduction is implemented every other year, thereby facilitating reproduction in alternate years, population-level effects are likely to be less severe. Similarly, providing sustained 3,100-3,600 cfs over a 9-year period is likely to result in lack of inflow and water exchange to river oxbow habitats for sustained periods and thereby incremental increases in terrestrial vegetation especially near oxbow-river junctions. The combined effects are likely to limit fish access to oxbow habitats as well as result in increased sedimentation of other main channel aquatic habitats, including potential adverse effects on sessile organisms such as mussels. The ACOE analysis should give additional treatment to these impacts, and propose alternatives (e.g., provision of occasional flow pulses as outlined in the Savannah River Ecosystem Flow Prescription) that could temporarily offset negative habitat effects (e.g., sediment accumulation, low dissolved oxygen, increased vegetation) associated with anthropogenically-prolonged low flow conditions. In summary, a modification of the DCP should consider interannual and intrannual variation in the implementation of discharges < 4,000 cfs.

Corrections to status and distribution of imperiled species

We have some specific edits and clarification on the status and distribution of the imperiled species in the Draft EA:

- On page 25, the robust redhorse (*Moxostoma robustum*) should be added to the fishery resources within J. Strom Thurmond Reservoir (JSTR).

- On page 32, the Georgia State-threatened Altamaha arcmussel (*Alasmidonta arcula*) and the South Carolina State-endangered brother spike (*Elliptio fraterna*) should be added and discussed in the Wildlife section.

- On page 34, the Atlantic sturgeon (*Acipenser oxyrinchus*) was included as a Federal Candidate species. This species was recently proposed as federally-endangered by the National Marine Fisheries Service (NMFS) in the Federal Register on October 6, 2010 (75 FR 61904).

- On pages 35-36, the Georgia State-threatened Altamaha arcmussel, South Carolina State-endangered brother spike, Georgia State-threatened Savannah lilliput (*Toxolasma pullus*), and Georgia State-endangered robust redhorse should be added to Table 6.

- On page 71, the brother spike should be included in the Augusta Shoals section.

- On page 82, the Altamaha arcmussel, brother spike, and Savannah lilliput should be included as threatened and endangered species that may be affected by the proposed action.

Corrections to hydropower, water quality, and water quantity information

On pages 20-23, the Draft EA references pumped storage operations and dissolved oxygen modifications involving JSTD and Richard B. Russell Dam (RBRD). It is our understanding that the dissolved oxygen injection system within JSTR has been completely installed and is operational; therefore, the information pertaining to the injection system, as well as the prior operating restrictions of RBRD that have now been removed, should be considered in the analyses and updated in the final EA. We appreciate ACOE's multiple actions to remediate dissolved oxygen problems that have been caused by your projects. Monitoring of the turbine venting projects at Hartwell Reservoir and JSTD has demonstrated significant improvements to downstream water quality.

On page 28-29, the Draft EA states that some species pass upstream by swimming through fully-opened dam gates at flows of 16,000 cfs or higher. New information provided by South Carolina Department of Natural Resources (SCDNR) for American shad (*Alosa sapidissima*) indicates that flows of 24,000 cfs, instead of 16,000 cfs, are required.

Objection to assessment of impacts to Augusta Shoals

In the description of the proposed action and alternatives analysis, the Draft EA states that "the 2008 EA determined that it is possible to release as little as 3,100 cfs under specific conditions with an acceptable level of impact." Our correspondence with ACOE since 2008 has provided direct evidence to the contrary.

The proposed flow reduction does not provide assurance that inflow into the Augusta Shoals, a significant flow-sensitive aquatic habitat will be maintained. For example, the 2009, 2010, and now 2011 EAs and FONSIs indicated that the City of Augusta would "use its best efforts" to provide 1,500 – 1,800 cfs in the Augusta Shoals during a flow reduction from 3,600 to 3,100 cfs. The ACOE also stated that "If the City fulfills this commitment, the impacts of the proposed flow reduction on biota within the Shoals would be minimal. If the City does not fulfill its commitment, impacts to the Shoal communities would be greater."

In 2008, the City stated that they would provide 1,000 to 1,500 cfs in the shoals during JSTD releases of 3,600-3,800 cfs. However, 1,000 and 1,500 cfs in the shoals were only equaled or exceeded 40 percent and 20 percent of the time, respectively, during the 2008 implementation of the DCP deviation. Shoal inflow reached a record low (between 0 and 310 cfs) on November 10, 2008. While canal inflow averaged twice that needed to maintain Augusta's water supply, minimum shoal inflow resulted in a 70-100 percent loss of available habitat for fishes in the shallow-swift guild and fishes with similar habitat requirements to the robust redhorse (data sources: USGS gages and SRIF study). This is a significant impact that the ACOE did not foresee in the 2008 FONSI.

The ACOE proposed a Temporary Deviation to the DCP in September 2010, including a flow reduction from 4,200 cfs to 3,800 cfs during Level 1 drought. The Service did not support this flow reduction in part because neither the ACOE nor the City of Augusta provided any assurances that the flow target in the shoals (1,500 cfs) would be maintained. Indeed, discharge calculations for the shoals in October and November 2010 fell below the 1,500 cfs target approximately 10 percent of the time, despite concurrent measurements of approximately 4,200 cfs from the Savannah River at Augusta gage. More recently, estimated shoal inflow fell below 1,500 cfs on 63% of measurements between April 15 and June 1, 2011. The Augusta Shoals harbors rare aquatic species such as the robust redhorse, shoals spiderlily, and the brother spike which are adversely impacted by flows less than 1,500 cfs.

ACOE's Draft EA did not acknowledge these factors in its analyses and has not provided any evidence that the system will be managed in a better manner during this latest proposed flow reduction, making this alternative unacceptable.

Objection to assessment of impacts to oxbows

A diversity of species are found in Savannah River oxbows, including the State-threatened Savannah lilliput and Altamaha arcmussel. On page 91, the Draft EA states that under Alternative 1, "Some sloughs and cutoff bends could be impacted by reduced flows. Mussels and other organisms in these areas could experience adverse effects. Given the overall project area, these localized occurrences would be minimal." These "localized" areas are the only areas in the Savannah River where these two species have been located. Therefore, while these locations may not encompass a large geographic area, they are extremely important habitat as they serve as the only habitat in the Savannah River for several State-listed species. As stated previously, the prolonged duration of low flows are likely to limit fish access to oxbow habitats as well as result in increased sedimentation of aquatic habitats, likely having adverse effects on sessile organisms such as mussels. Therefore, we do not agree with ACOE's conclusion that the effects on these areas would be minimal.

Objection to impact assessment for estuary and Savannah National Wildlife Refuge (NWR)

The primary mission of the Savannah NWR, established by Presidential Proclamation in 1927, is to provide habitat for migratory and wintering waterfowl and other wetland-dependent migrant birds. The nexus to providing this habitat is the 3,000-acre system of managed freshwater wetlands, which is dependent upon the Freshwater Diversion Canal. The Draft EA contends that

the freshwater/saltwater interface will remain downstream of the intake of the Freshwater Diversion Canal and would not affect Savannah NWR's ability to manage the freshwater pools or provide freshwater to private landowners. The Service strongly disagrees. Flow accretion below JSTD is critical to prevent the saltwater interface from moving upstream, especially to the canal intake and when dam releases are low. Level 4 drought operations imply a critical shortfall of precipitation and therefore an expected concomitant decrease in added volume downstream of JSTD. Therefore, the saltwater interface would indeed shift upstream even farther and potentially move into the canal, precluding Savannah NWR's ability to provide quality habitat. Also, the Draft EA fails to adequately consider the cumulative impacts of these short-term increases in salinity to freshwater marsh integrity on Savannah NWR and the Savannah estuary as a whole. The Draft EA fails to adequately incorporate the potential effects of the proposed Savannah Harbor deepening in conjunction with reduced freshwater inflow into the Savannah River estuary. Over 60% of the tidal freshwater wetlands originally within the estuary have been lost because of the upriver movement of the salinity gradient from harbor expansions and upriver flow reduction. The loss or temporary degradation of any wetland acreage is significant given so much is already permanently lost within the estuary and most of the remaining acreage of tidal freshwater wetlands occurs on the Savannah NWR.

The model results used in the analysis of potential flow reduction effects indicates salinity increases of < 1 parts per thousand (ppt) would occur at the I-95 bridge for reductions from 3,600 cfs to 3,100 cfs. Although the intake for the Freshwater Diversion Canal is located on the Little Back River, it is over five river miles downstream of the I-95 bridge. In reviewing salinity data for the USGS monitoring station at Lucknow Canal, which is less than two river miles below the intake, Savannah NWR is already experiencing salinity spikes up to 3.2 ppt during the critical months of October - January. The flow at Clyo during these periods is much less than the lower recommended range of 6,000 cfs as stated in the Service's 2003 FWCA report. We agree with the Draft EA where it states "river flows of 4,000 to 5,000 cfs and less at the USGS Clyo gage, have resulted in a stressed freshwater marsh plant community and an associated upriver shift of the salinity gradient (higher salinity zones)." The lack of precipitation associated with a Level 4 drought would most certainly result in flows at Clyo less than 5,000 cfs and, in all likelihood, less than the predicted flows for Alternative 1 (see Table 17, Draft EA). Small increases in salinity on a repetitive cycle within Savannah NWR's managed freshwater impoundments will have deleterious cumulative effects on the vegetation that is necessary to fulfill Savannah NWR's mandate to provide high-quality habitat for wetland-dependent migrant birds. To further reduce flow in an already stressed environment, could potentially have more severe and prolonged negative effects on the Savannah NWR and its ability to fulfill its mandated mission.

Over 60% of the tidal freshwater wetlands originally within the Savannah River estuary have been lost from the movement of the salinity gradient upriver because of harbor expansions and upriver flow reductions. The majority of the remaining tidal freshwater wetlands are located on the Savannah NWR. The Draft EA states that only "439 acres of freshwater marsh would undergo temporary adverse effects due to higher salinity as a result of Alternative 1." This statement is misleading. The loss or degradation of any wetland acreage is significant since so much of the tidal freshwater wetlands within the estuary has already permanently lost. The effects of even temporary saline water on freshwater marsh plant communities are not easily or quickly reversed within the impoundments. Several years of saturation with fresh water

(<0.5 ppt) are required to restore the integrity of the freshwater community within the managed impoundments. Reduced freshwater flows from reservoir discharges will further weaken an already tenuous hold on the managed wetlands within the Savannah NWR that provides sanctuary for an average of 23% of South Carolina's wintering waterfowl as well as a number of other migratory birds.

The Draft EA is especially troubling with the very real potential for the Savannah Harbor to be deepened to 48 feet, which will result in further losses of important tidal freshwater wetlands. The potential effects on the estuary and the Savannah NWR from proposed harbor expansion are uncertain. Therefore, any additional stressors, such as reduced flows, on the estuary could easily exacerbate or multiply the negative effects of the proposed harbor expansion. This potential is not considered within this Draft EA. Therefore, the Service disagrees with ACOE's contention that 439 acres of impact may be an overestimate; this may in fact underestimate the actual impact. Also, we are concerned with the use of the Model-to-Marsh (M2M) decision support system used in the analysis. In the Draft EIS for the Savannah Harbor Expansion, the USGS developed the M2M linkage to provide input into the Marsh Succession Model used to identify impacts to wetlands. The M2M linkage used salinity values in the tidal creeks and distributed those values across the marsh surface to estimate salinity values in the marsh root zone. However, the Marsh Succession Model produced erroneous results that were traced to flaws in the way the M2M linkage extrapolated salinity values and distributed them across the marsh. As a result, the Federal Cooperating Agencies abandoned the use of the Marsh Succession Models. Thus, it is uncertain why the results of the M2M have been used in this Draft EA when they were rejected for the Savannah Harbor Expansion Draft EIS - - the veracity of the M2M is no different in this case and should not be the basis for decisions here.. Although the Draft EA considered the M2M an appropriate tool to analyze potential impacts, the use of any model or part of a model that was subsequently rejected by other Federal agencies in a seemingly similar application of wetland impacts is troubling and surrounds any results with great suspicion.

Critical monitoring objectives and responsible parties list is incomplete

Alternative 1 of the Draft EA outlines critical, but not mandatory, monitoring objectives during periods where discharge is reduced to 3,100 cfs. The monitoring objectives for Service trust resources are not represented and it is concerning that monitoring for Service trust resources was not included as critical monitoring objectives in the Draft EA. In addition to the inclusion of the monitoring objectives we have proposed below, we ask that you also clarify the process for evaluating impacts associated with critical monitoring objectives, the duration of the evaluation process, and the adaptive management plan mentioned in the Draft EA.

Oxbow Habitat and Mussels

A diversity of native aquatic species are found in Savannah River oxbows, including numerous game fishes, the State-threatened Savannah lilliput, and State-threatened Altamaha arcmussel. The Draft EA states "*preliminary observations indicate that much [oxbow] habitat is lost or degraded due to loss of connectivity with the main river at flows below 4,000 cfs at Augusta. Even when some water is present, low dissolved oxygen levels are probable during the warmer seasons because of lack of river flows and stagnant conditions in those specific sites.*" The

Service expects that the flow reduction is less likely to exacerbate low dissolved oxygen problems in oxbows during the winter timeframe of the proposed flow reduction. However, the Draft EA indicates that "monitoring would be conducted of those oxbows to identify effects of the proposed flow reduction (page 73 of Draft EA)." While the Service agrees that monitoring of oxbow habitats should be a priority during periods of reduced flows, the Draft EA does not specify the responsible parties for funding and conducting the monitoring, nor what methodology or objectives would be employed. Oxbow habitat monitoring is not included as a monitoring objective in the Draft EA; therefore, we recommend that oxbow habitat and water quality monitoring be included in Table 13 on page 52. Mussel distribution data suggests that mussels occur in the vicinity of oxbows at elevations that could potentially be dry at discharge < 4,000 cfs. We suggest that relationships be developed among mussel distributions, densities, and discharge to be used as a component of an evaluation of flow management alternatives.

Augusta Shoals

Past iterations of proposed flow reductions suggested similar coordination between ACOE and the City of Augusta to ensure base flows for Augusta Shoals. The Draft EA clarifies that "the City is not required to implement the provisions of the yet-to-be finalized Settlement Agreement, [but the city] will use its best efforts to meet the terms for flows as set forth therein, including the higher flows during the month of February as set forth in the respective tiers." The Service emphasizes that this level of coordination has not resulted in actual implementation, and it appears that the City has disregarded this agreement in past and the recent period of low flows. We recommend that ACOE provide some means to ensure that aquatic base flows in the shoals are achieved, and that ACOE be responsible for a shoal inflow monitoring component during all drought levels (*sensu* the Agreed Aquatic Base Flow table).

Savannah NWR Salinities

Over 60% of the tidal freshwater wetlands originally within the Savannah River estuary are lost from the regular incursion of the salinity gradient upriver due to conditions caused by harbor expansions and reduction of flows upriver. The majority of the remaining tidal freshwater wetlands are located on the Savannah NWR. The Draft EA states that only "439 acres of freshwater marsh would undergo temporary adverse effects due to higher salinity as a result of Alternative 1." This statement is misleading since the loss or degradation of <u>any</u> wetland acreage is significant given so much of the tidal freshwater wetlands within the estuary is already permanently lost. Also, the effects of saline water on freshwater marsh plant communities are not easily or quickly reversed within the impoundments. Several years of saturation with fresh water (<0.5 ppt) is required to restore the integrity of the freshwater community within the managed impoundments. Reduced flows will further weaken an already tenuous hold on the managed wetlands within the Savannah NWR that provides sanctuary for an average of 23% of South Carolina's wintering waterfowl as well as a number of other migratory birds. Thus, critical monitoring objectives at the Savannah NWR are the target Clyo discharge of > 4,500 cfs and salinity profiles in the vicinity of the Savannah NWR. We recommend that these monitoring objectives be included in the monitoring strategy during all drought levels.

Sturgeon

It is unclear as to how the potential effects of the proposed alternative to shortnose sturgeon (*Acipenser brevirostrum*) will be monitored. The Draft EA states that the flow reduction would be maintained until the end of February or until such time that a monitoring parameter, such as sturgeon migration, is outside of acceptable levels. In past iterations of ACOE's Draft EA's related to the DCP, the Service highlighted concerns and problems associated with the ACOE's proposed sturgeon-related management triggers. The Draft EA makes no mention regarding how the shortnose sturgeon migration would be monitored. We recommend that the methodology to monitor effects to shortnose sturgeon be described in sufficient detail in ACOE's Draft EA, and such methodology include at a minimum, appropriate measures of sturgeon occurrence, migration, spawning, and recruitment.

Coordination and ESA consultation

We concur with your determination that the proposed action is not likely to adversely affect the wood stork or manatee. However, although we have concerns about the adequacy and appropriateness of your determination regarding the endangered shortnose sturgeon, NMFS is the designated lead agency and will need to address your determination regarding potential impacts to shortnose sturgeon. As such, their agency needs to be included in Table 19 on page 93 of the Draft EA in reference to the ESA.

Summary

Our general concerns and recommendations are summarized below.

- The process for selecting the specific drought reservoir levels should be clarified and their use justified.
- Procedures for reductions in water use during periods of low inflow to ACOE and other reservoirs in the basin should be based on triggers to reservoir levels, basin inflow and climatic thresholds.
- When the reservoirs reach Levels 1-4, ACOE should issue public advisories regarding the status of the reservoir levels and the need for the public to engage in reduced water consumption.
- Any change to the DCP should include a proposed action alternative that reduces impacts to downstream environments less than the currently proposed action alternative. Measures to consider should include early water conservation, re-siting or modification of water intakes to prolong their use as reservoir levels recede, alternative operational strategies to ensure shoal and Savannah NWR freshwater inflows, and adequate discharge to ensure and maintain habitat for downstream species.
- ACOE should provide some means to ensure that aquatic base flows in the shoals are achieved.
- The impacts to imperiled species located in oxbow habitats, as well as the changes to the location of the saltwater/freshwater interface and the resulting impacts of higher salinity on Savannah NWR should be adequately characterized.

- The cumulative impacts of the proposed action and the proposed Savannah Harbor deepening on Savannah NWR and the Savannah estuary should be incorporated; and the cumulative impacts to freshwater marsh integrity of repeated short-term increases in salinity.
- The current Model-to-Marsh (M2M) decision support system should not be used as the analysis to estimate salinity values in the marsh root zone
- The process should be clarified for evaluating impacts associated with critical monitoring objectives, the duration of the evaluation process, and the adaptive management plan mentioned in the Draft EA.
- Critical monitoring objectives should include oxbow habitat and water quality monitoring, Augusta shoals inflow monitoring, and Savannah NWR monitoring using the target Clyo discharge of > 4,500 cfs and salinity profiles in the vicinity of the Savannah NWR.
- The methodology to monitor effects to shortnose sturgeon should be fully described and such methodology should include at a minimum, appropriate measures of sturgeon occurrence, migration, spawning, and recruitment.

The proposed flow reduction to 3,100 cfs (Alternative 1) is likely to 1) exacerbate ongoing low flow problems in the Augusta Shoals, causing harm to shoal-inhabiting fauna including rare species such as the robust redhorse, brother spike, and shoals spiderlily; 2) reduce the already limited shortnose sturgeon spawning habitat below NSBL&D; 3) degrade or cause loss of oxbow habitat which supports the Altamaha arcmussel and Savannah lilliput; and 4) adversely affect the mission of the Savannah NWR to provide high quality, freshwater wetlands for breeding, migrating, and wintering waterfowl. Consequently, the Service objects to the alternative development and implementation of this proposed modification to the DCP.

Finally, the Service reminds ACOE that when a water body is proposed to be controlled or modified "for any purpose whatever" by a Federal agency, the action agency is required *first* to consult with wildlife agencies (Federal and State) "with a view to the conservation of fish and wildlife resources." Doing so enables ACOE and other agencies to develop an informed alternative that minimizes impacts to fish, wildlife, and ecosystems while meeting project objectives. To ensure sustainability for these resources, the Service will continue to work cooperatively with ACOE. In particular, the Service and NMFS need to be an integral member of ACOE's team when formulating and evaluating operational alternatives.

If you have questions, please contact Will Duncan or Alice Lawrence (Georgia Ecological Services) at 706-613-9493 x 227, Chuck Hayes (Savannah NWR) at 843-784-9911, or Amanda Hill (Charleston Ecological Services) at 843-727-4707.

Sincerely,

Sandra S. Tucker
Field Supervisor

cc: USFWS, Charleston ES, Charleston, SC
USFWS, Savannah NWR, Hardeeville, SC
USFWS, Georgia ES, Townsend, GA
USFWS, Asheville ES, Asheville, NC
Stephania Bolden, NMFS, St. Petersburg, FL
NMFS, Charleston, SC
Ed Bettross, GDNR, Thomson, GA
Bill Bailey, ACOE, Savannah, GA

From: Joe Brenner
To: CESAS-PD, SAS
Subject: Comment on Draft EA and Draft FONSI - Drought Contingency Plan
Date: Tuesday, July 12, 2011 3:00:14 PM

I strongly object to the Corps proposal of targeted flows at Drought Level 4, as opposed to the existing "Flow in equal flow out" plan. This is based on the following:

1. The focus of any changes to the Drought Contingency Plan should be on mitigation of drought impacts. Modifications should not be approached piecemeal, but as part of a comprehensive review of the entire plan based on lessons learned. The Corps, in the person of General Schroedel, committed to amend the existing Drought Contingency Plan, based on lessons learned during the Drought of Record. As an example, during Level 3 conditions, flows were in fact lowered to 3100/3600CFS during winter/summer with no significant adverse consequences. The Corps also did limited adaptive management by significantly curtailing flows when downstream rainfall and flows permitted. The Corps has failed to follow through on this commitment.

2. No change of this magnitude and with such potential for adverse consequences should be done through the EA process, which has historically been used for temporary modifications to address current conditions. There has never been a comprehensive study of the impacts of operation on the Savannah Lakes below Level 4 conditions. There is the potential for significant adverse impacts to the fishery, water quality, water supply, etc.
Any such proposal must be assessed through an Environmental Impact Study, with substantial stakeholder involvement.

Joseph F. Brenner
1164 Old Andersonville Rd
Hartwell, GA 30643

14

July 11, 2011

Mr. William G. Bailey
Chief, Planning Division
Corps of Engineers, Savannah District
100 W. Oglethorpe Avenue
Savannah, GA 31401-3640

Re: J. Strom Thurmond Reservoir Discharge Reduction EA
McCormick County, South Carolina
SHPO No. 11JB0050

Dear Mr. Bailey:

Thank you for your letter of June 14, which we received on June 15, regarding the above-named project. We also received the Draft Environmental Assessment and Finding of No Significant Impact and Appendices as supporting documentation for this undertaking. The State Historic Preservation Office is providing comments to U.S. Army Corps of Engineers pursuant to Section 106 of the National Historic Preservation Act and its implementing regulations, 36 CFR 800. Consultation with the SHPO is not a substitution for consultation with Tribal Historic Preservation Offices, other Native American tribes, local governments, or the public.

The Environmental Assessment notes that no archaeological survey of the shoreline has been conducted, yet significant known archaeological resources are present and are being affected by the operation of the reservoir. The SHPO recommends that an intensive cultural resources survey be conducted on the shore lines of J. Strom Thurmond Reservoir in order to identify additional historic properties that may be affected by the proposed draught discharge reduction. Our office recommends this survey because there are known archaeological sites within the Area of Potential Effect (APE). The purpose of the recommended survey is to identify cultural and historic sites, particularly archaeological sites, and evaluate their eligibility for listing in the National Register of Historic Places (NRHP). The results of this survey will be used determine how changes in pool elevations are affecting historic properties. Information about South Carolina and Federal standards and guidelines and a list of qualified consultants can be found at the following web sites:

SHPO Guidance for Archaeological Surveys: http://www.palmettohistory.org/archaeology/SHPOGuidance.htm
Project Professionals List: http://shpo.sc.gov/programs/professionals/

If you have any questions, please contact me at (803) 896-6181 or jbarnes@scdah.state.sc.us.

Sincerely,

Jodi Barnes

Jodi Barnes, PhD
Staff Archaeologist/GIS Coordinator
State Historic Preservation Office

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

263 13th Avenue South
St. Petersburg, FL 33701
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http://sero.nmfs.noaa.gov

F/SER31:SKB

Colonel Jeffrey M. Hall
Commander, Savannah District
U.S. Army Corps of Engineers
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Attention: Larry Olliff

Dear Colonel Hall:

This is in response to your letter received by the National Marine Fisheries Service (NMFS) on June 20, 2011, requesting comments on your draft Environmental Assessment (EA) regarding a change in the minimum average discharge from the J. Strom Thurmond (JST) Reservoir. The COE is seeking a temporary deviation from the Savannah River Basin Drought Contingency Plan (SRBDCP) that was updated in 2006. NMFS reviewed the SRBDCP and concluded that the action would not likely adversely affect the shortnose sturgeon (I/SER/2006/04409). The SRBDCP required water releases from the JST Dam at rates no less than 3,600 cubic feet per second (cfs). Subsequently in November 2008, NMFS agreed that a temporary deviation from the SRBDCP reducing flow from 3,600 cfs to 3,100 cfs though January 31 would not adversely affect shortnose sturgeon (I/SER/2008/06975) and specified information required to reinitiate section 7 consultation to extend the reduced flow through February. In June 24, 2009, NMFS transmitted to COE a letter outlining issues and concerns with the reduced flow regimes and recommended actions and research that should be undertaken to better understand potential impacts of reduced flow, particularly to shortnose sturgeon. In September 2009 the COE again requested to extend the deviation through February; NMFS replied on November 6, 2009, that we could not concur that the shortnose sturgeon would not be adversely affected by the continued reduction of flow because appropriate information was not available (T/SER/2009/05470).

The draft EA proposes to deviate from the SRBDCP by reducing discharge from the JST Dam from 3,600 cfs to 3,100 cfs from November 1 through February 28 when the COE reservoirs on the Savannah River are in Level 4 drought conditions. The deviation would continue for the duration of the present drought. Herein NMFS provides a consolidated response from both the Protected Resources Division under the purview of the Endangered Species Act (ESA), and the Habitat Conservation Division under the purview of the Fish and Wildlife Coordination Act, and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) on the draft EA.

A reduction in flow pattern is likely to affect both diadromous fish spawning and recruitment potential in the Savannah River. In particular the federally-protected shortnose sturgeon are known to utilize the gravel bar just below New Savannah Bluff Lock and Dam (NSBLD) as spawning habitat; all habitat upstream of this location is not accessible due to severely limited

fish passage. NMFS believes that the reduction in flow during the months of February and March will negatively impact this extremely limited spawning habitat by making submerged areas emergent. Further because water velocity and flow regime influence sturgeon spawning by stimulating adult fish to move up to spawning grounds, NMFS is concerned about modification of flow patterns prior to shortnose sturgeon actual arrival at the gravel bars. The reduced access to spawning sites coupled with the potential of reduced or failed recruitment is a concern to NMFS as affects as chronic impacts to both status of the population and the progeny of future generations that will be realized indefinitely.

The draft EA fails to provide information to support the conclusion that shortnose sturgeon would not be adversely affected by the continued reduction of flow. NMFS would require an analysis of how reduced flow impacts the known spawning area below NSBLD, and consequences of the reduction in areal availability of spawning substrate. Specifically the draft EA fails to incorporate results from two recent investigations funded by the COE that investigated impacts of flow on the gravel bars downstream NSBLD. In particular those studies found:

1. A flow of 6870 cfs is necessary to keep Gravel Bar #2 submerged (Grabowski and Isely 2007).
2. A flow of 6200 cfs is necessary to keep 0.3 meters of water over the top of Gravel Bar #1 (Jackson and Long 2011).
3. Gravel bars are submerged when flow is about 4ft on Augusta gage which equated to about 5,000-6,000 cfs (D. Allen SCDNR Pers. Com. As cited in Meyer et al. 2003).

Therefore, because the time period requested for the action overlaps with shortnose sturgeon spawning, we cannot concur with your determination in the draft EA that the action would not adversely affect a threatened or endangered species. A formal Section 7 consultation would be required to ensure the proposed action did not jeopardize the continued existence of shortnose sturgeon. However, NMFS could agree with your determination that the action does not adversely affect shortnose sturgeon if the period was modified and flows were returned to 3,600 cfs by February 1.

The effects of the drought flow reductions on Essential Fish Habitat (EFH) in the lower Savannah River estuary remain unclear. Effects of the proposed flow reductions on EFH would be reflected in the balance between tidal freshwater marsh and oligohaline marsh. The physiography of the Savannah River Estuary has been extensively modified during the past 150 years, and those modifications have altered the physical factors that result in the relative distribution of these marsh habitats; sea level rise and components of the Savannah Harbor Expansion Project, assuming it is constructed, would further alter these physical factors and, consequently, distribution of these marsh types. While we agree that the effects of the proposed flow reductions from JST Dam would likely have less of effect on marsh habitat than these other causes, particularly if the flow reductions did not occur past January 31, we request the COE further substantiate the claim that the habitat shifts would not impair the nursery function of the marsh during the spring when larval shrimp, crabs, and flounder use these areas. Our letter from June 24, 2009, is enclosed and provides recommendations for examining impacts to riverine habitat from the proposed flow reductions from JST Dam should the COE continue to propose reducing flows beyond January 31.

We appreciate the opportunity to provide comments on the draft EA and look forward to continued cooperation with the COE in conserving our resources. Related correspondence regarding EFH should be directed to Mr. Prescott Brownell at our Atlantic Branch Habitat office, 219 Fort Johnson Road, Charleston, South Carolina, 29412. He may be reached by telephone at (843) 762-8609, or by e-mail at Prescott.Brownell@noaa.gov. For information specific to the

endangered shortnose sturgeon, correspondence should be directed to Dr. Stephania Bolden, Protected Resources Division, at the letterhead address, by telephone at (727) 824¬5312, or by e-mail at Stephania.Bolden@noaa.gov.

Sincerely,

David M. Bernhart
Assistant Regional Administrator
for Protected Resources

Enclosure

cc: F/SER47/Brownell and Wilber

File: 1514.22.f.1.GA
Ref: T/SER/2011/02480

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE

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June 24, 2009 F/SER4:PB/pw

(sent via electronic mail)

Colonel Edward J. Kertis
Commander, Savannah District
U.S. Army Corps of Engineers
100 W. Oglethorpe Avenue
Savannah, Georgia 31401-3640

Attention: Jeffrey Morris

Dear Col. Kertis:

NOAA's National Marine Fisheries Service (NMFS) reviewed your letter, dated June 4, 2009, requesting information on the impacts to fishery resources and habitats from the reduced outflows from the J. Strom Thurmond (JST) Dam during the 2006-2009 drought of record in the Savannah River Basin.

During the drought, NMFS participated in frequent meetings with your staff, state and federal resource agencies, local governments, and non-governmental organizations concerning the water resource issues presented by the drought. Our concerns regarding potential effects of reduced water flows on marine and migratory diadromous fish were presented and discussed during the meetings.

Public trust resources potentially affected by altered Savannah River instream flow conditions include migratory diadromous species such as striped bass, American shad, blueback herring, Atlantic and shortnose sturgeon, and American eel. Shortnose sturgeon is listed as endangered under the Endangered Species Act and present in the Savannah River downstream of Augusta Diversion Dam and Savannah Bluff Lock & Dam as well as the Savannah River estuary. Riverine and estuarine habitats downstream from the JST Dam provide spawning and maturation habitat for those migratory species. Aquatic habitats and fishery resources of the Savannah River estuary are also potentially affected by altered JST outflow conditions, in combination with potential effects of the Savannah Harbor Expansion Project.

Attached is a summary of concerns and recommended studies we provided by email to Mr. Bill Bailey of your staff following the interagency meeting on May 11, 2009, at the Phinizy Swamp Nature Park Conference Center. That meeting provided for helpful interagency discussions of potential impacts from flow reductions and the information that would be within future assessments.

We hope this information is helpful. Related correspondence should be directed to the attention of Mr. Prescott Brownell at our Atlantic Branch office, 219 Fort Johnson Road, Charleston, South Carolina, 29412. He may be reached by telephone at (843) 953-7204, or by e-mail at Prescott.Brownell@noaa.gov. For information specific to the endangered shortnose sturgeon, correspondence should be directed to Dr.

Stephania Bolden, Protected Resources Division, at the letterhead address, by telephone at (727) 824-5312, or by e-mail at Stephania.Bolden@noaa.gov.

Sincerely,

/ for

Miles M. Croom
Assistant Regional Administrator
Habitat Conservation Division

cc:

CESAS, Jeffrey.S.Morris@usace.army.mil
CESAS, William.G.Bailey@usace.army.mil
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flite@naturalsciencesacademy.org
F/SER3, Stephania.Bolden@noaa.gov

Response to COE: Savannah River: Low Flow/Drought
NOAA National Marine Fisheries Service
May 22, 2009

Unanticipated record drought conditions and critical water flow issues experienced in 1998-2009, particularly since 2005, have reduced reservoir storage capacity, and limited flexibility in regulating water flow in the Savannah River Basin. Strong concerns have been expressed by residents in the upper Savannah Basin regarding reduced water levels in the reservoirs, and potential effects on municipal water supply intakes, marina operations, and recreational water access.

A temporary reduction in the specified drought management plan occurred in early 2009; flow was reduced from 3,600 cfs to 3,100 cfs. It is anticipated that a flow reduction may again be requested by the U.S. Army Corps of Engineers (COE) in the future.

Reduction of minimum drought flows may affect both anadromous fish spawning and recruitment potential in the Savannah River. Species under NMFS stewardship that would likely be affected by reduced flow include American shad, blueback herring striped bass, Atlantic sturgeon, and shortnose sturgeon. The shortnose sturgeon is an endangered species listed under the Endangered Species Act (ESA); the Atlantic sturgeon is a candidate for listing. All of these fish are known to spawn in the early spring (February through March); therefore, any flow regime must be thoroughly analyzed to assess its effects on both spawning migration and habitat, particularly for the shortnose sturgeon pursuant to section 7 of the ESA.

Recently The Nature Conservancy (TNC) organized a meeting to discuss the biological and ecological flow requirements for the Savannah River during extreme low flow/drought conditions. Participants included TNC, NMFS, COE, USFWS, SCDNR, GADNR, GADDR, UGA, SCDHEC, and SCDNR. At the meeting conclusion, the COE requested that each agency submit a list of constraints, concerns and recommendations. The following is a summary from NMFS:

1. Constraint: shortnose sturgeon spawning period between February 1 and May. Shortnose sturgeon utilize the gravel bar just below New Savannah Bluff Lock and dam during the spawning season; all habitat upstream of this location is not accessible due to lack of fish passage. Assurances that any reduction in flow from the current flow regime of 3,600 cfs would not affect shortnose sturgeon or its limited spawning habitat.
2. Concerns:
    a. Little information exists on how flow rates impact the availability of spawning habitat in terms of water depth, substrate availability, migratory cues, larval dispersal, etc.
    b. Limited flow gauges on the river provide insufficient data to determine downstream effects of regulated flow.
    c. The guide curve regulating flow and reservoir depth in the upper Savannah River has greatly reduced the seasonal variability in water flow.
    d. The conservation level and full pool depths may not be appropriate and have not been recently analyzed and were designated about 50 years ago.

e. A deviation in flow from the 3,600 cfs to 3,100 cfs translates into 0.6 ft per month in reservoir elevation.

3. Recommendations:
   a. COE revisit the guide curve including the conservation depth and full pool levels.
   b. COE revisit the potential to provide fish passage appropriate for sturgeon around NSBLD.
   c. Assessment of the habitat at Augusta Shoals as potential spawning habitat for shortnose sturgeon.
   d. Analysis of hydrologic records (pre-dam) to identify periods of high flow and natural seasonal variability. Correlation of flow regimes to spawning periodicity of anadromous fish inhabiting the Savannah River and required cues; ensure appropriate flow/species (see Kynard 1997 for shortnose sturgeon).
   e. Assessment of habitat suitability/availability under different flow regimes.
   f. Assessment of flow regimes on sediment distribution and re-suspension, especially relative to shortnose sturgeon spawning habitat.
   g. A technical (site specific) instream flow assessment to provide an adequate basis for evaluation of potential effects on sturgeon and other anadromous species spawning habitats. Details are provided in Appendix A. (Attached).

Appendix A. Instream Flow Study

Prior ecological instream flow studies on the upper Savannah were not designed to assess extreme drought flow conditions in the Thurmond and Stevens Creek tailwater reaches, the Augusta Shoals, the riverine habitat reach below Savannah Bluff Lock & Dam, and the lower Savannah River.

An instream flow would provide a sound technical basis for evaluation of alterative drought flows, and potential effects on aquatic species, important habitats and water quality. Site-specific studies may be focused on specific reaches where prior studies did not fully address the potential effects of extreme drought flows on important species life cycle needs.

The study approach should include the following key study elements:

- Establish an interagency instream flow study team
- Review prior instream flow studies conducted in the upper Savannah River
- Determine the appropriate study area(s) where additional assessment is needed
- Identify key aquatic species or guilds potentially affected
- Identify key habitat suitability criteria for each species
- Select instream flow study methodologies (IHA + species/habitat field study)
- Develop draft and final study plans

Key evaluation species to be considered

- Shortnose sturgeon
- Atlantic sturgeon
- American shad, hickory shad, river herring
- Striped bass (Inland spawning stock model)

Key habitat considerations to be evaluated:

- Anadromous species spawning habitats, maturation habitats (areal extent, suitability, accessibility)
- Effects of flows on fish movements to and from spawning habitats
- Effects of flows on fish passage and facility operations (existing and planned)

Instream flow methodologies to consider

- IFIM/PHABSIM
- HEC-EFM
- MESOHABSIM (may be best suited for sturgeon habitat characterization and assessment of instream flows)
- IHA (In combination with a technical instream flow assessment)

From: Kishoni, Lisa
To: CESAS-PD, SAS
Cc: Kishoni, Eyal; YAKOV DUBIN; Garland, Dan J [BMG]
Subject: RE: Comment on Draft EA and Draft FONSI - Drought Contingency Plan
Date: Thursday, June 16, 2011 3:34:29 PM

I fully support the amendment to the Drought Contingency Plan reducing releasing from Thurmond Dam from 3600 to 3100 in Nov.-Feb. when the basin is in drought level 4. The most recent drought proved that we need to conserve as much water as we can in the reservoirs, in the event that drought persists. I would have actually liked to see a reduction in flows at Drought Level 1, 2 or 3. Waiting until we are in drought level 4 is almost too late!

Thank you,

Lisa Kishoni

From: JAMES HERRMANN
To: CESAS-PD, SAS
Subject: Thurmond Dam Outflows During Level IV Drought
Date: Saturday, June 18, 2011 1:44:52 PM

Gentlemen,

Please go forth with the proposed revision which would allow Thurmond Dam outflow deceased to as low as 3,100 cfs from Nov 1 through Feb 28. Allowing more flexibility in water management constraints benefits all interests in the reservoir and river system.

Please do not hesitate to contact me for further clarification.

Jim Herrmann
501 Standing Rock Ln
Evans, GA 30809

From: Jay Pondy
To: CESAS-PD, SAS
Cc: Jim Herrmann
Subject: Lake Levels
Date: Wednesday, June 22, 2011 3:03:47 PM

Gentlemen,

Please go forth with the proposed revision which would allow Thurmond Dam outflow deceased to as low as 3,100 cfs from Nov 1 through Feb 28. Allowing more flexibility in water management constraints benefits all interests in the reservoir and river system.

Please do not hesitate to contact me for further clarification.

Jay Pondy
971 Scotts Ferry Trl
Appling, GA
30802

From: keitt wilson
To: CESAS-PD, SAS
Subject: Drought Conditions
Date: Saturday, June 18, 2011 10:10:46 PM

We all know what happens when you request public input as to your intentions or suggestions on situations beyond our control. Satisfying a special interest group such as the Lake Hartwell Association will always be ready to recommend a solution that will always be in their best interest regardless of the undesirable consequences on others. It is my hope that the Corps of Engineers decisions are made on what's best for all concerned and is not pressured by these special interest groups.

From: SBOOHER@aol.com
To: CESAS-PD, SAS
Subject: Fwd: Public Comment for Army Corps New Drought Plan
Date: Saturday, June 25, 2011 7:52:13 PM

From: SBOOHER@aol.com
To: CESAS-PD@usace.army.mil.gov
Sent: 6/25/2011 6:44:06 P.M. Eastern Standard Time
Subj: Public Comment for Army Corps New Drought Plan

Commander
Savannah Corps of Engineers
Attn: PD
Box 889
Savannah , GA 31402-0899

25 June 2011

Subject: Army Corps New Drought Plan

Currently the City of Augusta by way of the Augusta Canal removes water at approximately 3,600 cubic feet per-second (cfs) from the Savannah River. Even with the local area in drought conditions water is currently flowing over the canal's ray's creek spillway into Ray's Creek. Why because there is truly no accurate gage measuring nor any Corps management of the Augusta Canal flow. I am aware of a USGS gage on the canal but its data is not accurate enough nor is there any management utilizing even this information. The canal water is removed above the Augusta Shoals and returned to the Savannah River below the shoals minus the water removed for drinking by Richmond County.

When due to drought conditions Cark Hill lake level drops to 312 ft. the Corps currently considers the lake to be at Drought Level four. They then limited the water release to 3,600 cfs, this results in the only water going through the Augusta shoals is the small amount coming in from Stevens Creek and several other small creeks from the Georgia and South Carolina banks from Clark Hill Dam to the Old Lock and Dam. Why because the Augusta Canal is taking all of the remaining water. The Corps needs to take Ray's Creek spillway lost flow from the shoals as well as a needed drop of 500 cfs into consideration as part of their new Drought plan is adopted.

If the proposed drop to 3,100 cfs is put in place and there is no communication and written agreement worked out with the Mayor/ Richmond County Commissioners and their lawyers the shoals during this low flow period will be dry. A written agreement needs to be put in the New Drought Plan that insures an equal 500 cubic feet per second drop in withdrawal from the Savannah River by the City Water Department at the Canal Head gate. This 500 cfs drop must be verified by the Army Corps prior to Clark Hill Dam going to this new low level of discharge.

The New Drought Plan needs to also state that, in reverse order, only after the Corps

increases the 3,100 back to 3,600 cfs and informs the City Manager, should the City Water Department be permitted to again increase its withdrawal from the Savannah River.

The Savannah Corps needs to also insure an accurate gage that records Canal water withdrawal from the Savannah River is installed. Currently the Ray's Creek spillway is the only accurate way to know when excess water is flowing through the canal. During our current drought, the City Water Department is currently withdrawing so much water that the Ray's Creek has at least 200 cfs going over the spillway today.

Sam Booher
4387 Roswell Dr
Augusta, GA 30907

From: Caren Johnson
To: CESAS-PD, SAS
Subject: Savannah River Reservoirs
Date: Thursday, June 23, 2011 10:32:10 AM
Attachments: States and Counties of intrest.pdf

June 23, 2011

Mr. Larry Olliff

Choctaw Nation of Oklahoma has reviewed the following proposed project (s) as to its effect regarding religious and/or cultural significance to historic properties that may be affected by an undertaking of the projects area of potential effect.

RE: Managing water in the Corp' three Savannah River Reservoirs during time of extreme drought

After further review of the above mentioned project (s), and based on the information provided it has come to our attention that the project is out of the Choctaw Nation of Oklahoma areas of interest. A list of states and counties has been provided. If we can further assistance please contacted our office at 1-800-6170 ext. 2137.

Sincerely,

Terry D. Cole

Tribal Historic Preservation Officer

Choctaw Nation of Oklahoma

Caren Johnson

Administrative Assistant

Choctaw Nation of Oklahoma

P. O. Box 1210

Durant, OK 74702-1210

1-580-924-8280 Ext. 2133

Fax 1-580-920-3181

ANDERSON AREA
CHAMBER OF COMMERCE

907 North Main Street
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andersonscchamber.com

June 29, 2011

Colonel Jeffrey M. Hall
US Army Corps of Engineers
PO Box 889
Savannah, Ga. 31402-0889

Re: Savannah River Basin Level 4 Drought Operations Study

Dear Colonel Hall:

On behalf of the Anderson Area Chamber of Commerce, I am responding to the Draft Environmental Assessment and Finding of No Significant Impact (FONSI) that was recently released. Our key comment on this assessment is a very simple one. While we agree with reduction of outflows of the Lake Thurmond Dam from 3600 to 3100 cfs, we question why this action was only considered for Drought Level 4. We were under the impression that the Corps was considering the reduction of outflow from Thurmond in Drought Levels 2 and 3. We understand that reductions at the earlier drought phases may cause the initiation of an Environmental Impact Study and of course, more funding will be required.

The Anderson Area Chamber of Commerce encourages the Corps to look into this matter further even if it requires further study. Please clarify for us why we did not pursue this question any further than Drought Level 4. Thank you for your consideration.

Respectfully,

Dyke Spencer, Chairman
Anderson Area Chamber of Commerce
Water Resources Committee

Cc: Board of Directors

GEORGIA
DEPARTMENT OF NATURAL RESOURCES
COASTAL RESOURCES DIVISION

MARK WILLIAMS
COMMISSIONER

A.G. 'SPUD' WOODWARD
DIRECTOR

July 13, 2011

US Army Corps of Engineers
Attn: Bill Bailey, PD, Savannah District
100 W. Oglethorpe Ave.
Savannah, Georgia 31401-3640

RE: Consistency Determination for SRBDCP Plan Modification, Savannah River, SC & GA

Dear Mr. Bailey:

Staff of the Georgia Coastal Management Program (GCMP) has reviewed your June 14, 2011 Notice of Availability of a Draft EA and Draft FONSI for a modification to the US Army Corps of Engineers' Savannah River Basin Drought Contingency Plan (SRBDCP) on the Savannah River in Georgia and South Carolina. The proposed action is to retain the major components of the 1989 SRBDCP and adjust one feature. If Level 4 drought conditions exist, the daily average release at Thurmond Dam would be adjusted from 3,600 cfs to 3,100 cfs during the period 1 November through 28 February. The Corps will restore water flows back to 3,600 csf if requested by either the State of Georgia or the State of South Carolina.

Adherence to the Savannah River Basin Drought Contingency Plan (SRBDCP) has prevented the Savannah River reservoirs from reaching Drought Level 4 Status through two droughts of record in the last 10 years. The proposed modification better defines the release schedule while in Drought Level 4 Status and would delay the onset of lower flows as currently prescribed in Level 4 of the SRBDCP. The Savannah lilliput (*Toxolasma pullus*) is recognized as threatened by Georgia with a sub-national rarity ranking of S2 and should be included in Table 6, page 35 and in monitoring assessments.

The Program concurs that this proposed action is in compliance with the GCMP to the maximum extent practicable. We stand ready to work with the Corps and other agencies to capture the knowledge gained during the last two droughts of record to consolidate the SRDBCP into one succinct document. Please feel free to contact Kelie Moore or me if we can be of assistance.

Sincerely,

A.G. "Spud" Woodward
Director

ONE CONSERVATION WAY | BRUNSWICK, GEORGIA 31520-8686
912.264.7218 | FAX 912.262.3143 | WWW.COASTALGADNR.ORG

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Operations & Maintenance 843.987.9220
Engineering 843.987.9250
www.bjwsa.org

DEAN MOSS, General Manager

June 21, 2011

Mr. William G. Bailey
Chief Planning Division
U. S. Army Corps of Engineers,
Savannah District, Mobile/Savannah Planning Center
P.O. Box 889
Savannah, Georgia 31402-0889

Re: Level 4 Drought Operations—Savannah Basin

Dear ~~Mr. Bailey:~~ Bill

The purpose of this letter is to strongly support the flow reduction to 3100 cfs from 3600 cfs during Level 4 drought as outlined in the Environmental Assessment.

The Beaufort Jasper Water and Sewer Authority is the main provider of water and sewer services to 120,000 people in Beaufort and Jasper Counties, South Carolina. We have relied on the Savannah River as our principal water supply since the early 1960s. Our intake is at River mile 39.1, north of Hardeeville with a bottom elevation of approximately -3 ft. msl with our pumps designed to take suction at +3 ft msl. As you can imagine, the stage of the river is important to us. The change in the Drought Management Plan to keep flows at 3600 cfs during the summer and 3100 cfs during the winter should maximize the water available in storage for as long as possible.

BJWSA very much appreciates the District's willingness to be creative in its management of the system in times of drought. This proactive change before we reach a Level 4 Drought condition will lead to better management of the system during times of drought.

Sincerely,

Dean

William D. Moss, Jr.
General Manager

OFFICE OF PLANNING AND BUDGET

Nathan Deal
Governor

Debbie Dlugolenski Alford
Director

GEORGIA STATE CLEARINGHOUSE MEMORANDUM
EXECUTIVE ORDER 12372 REVIEW PROCESS

TO: Larry Olliff (ATTN:PD)
U.S. Army COE, Savannah District
100 W. Oglethorpe Avenue
Savannah, GA 31401-3640

FROM: Barbara Jackson
Georgia State Clearinghouse

DATE: 6/15/2011

APPLICANT: U.S. Army COE, Savannah District / GA DNR Coastal Resources Div. / SC Dept. of Health & Environmental Control-Ofc of OCRM

PROJECT: Draft EA/FONSI: Level 4 Drought Operations, Savannah River Basin and JPN: Reduce daily average discharge from J. Strom Thurmond Reservoir when in drought level 4 from November 1st through February 28th

STATE ID: GA110615001

The applicant/sponsor indicated that they are in coordination with various agencies under Georgia's Department of Natural Resources.

Therefore, this office's review of this particular proposal has been completed, being found consistent with those state or regional goals, policies, plans, fiscal resources, criteria for Developments of Regional Impact (DRI), environmental impacts, federal executive orders, acts and/or rules and regulations with which the state is concerned.

/bj

Form NCC
Oct. 2008

July 14, 2011

Subject: Drought Operations Study Environmental Assessment

US Army Corps of Engineers
Attn: PD, Savannah District
Savannah, Georgia 31402-0889

After careful review of the recommended changes to the SRB Drought Management Plan as defined in the draft ***Savannah River Basin Level 4 Drought Operations Study*** Environmental Assessment (EA) as well as a number of discussions with water stakeholders, I cannot agree with the proposal. Neither do I agree with the draft "***Finding of No Significant Impact*** (FONSI)" as stated in the document.

Past discussions with the Corps regarding revisions about how to manage lake water levels always revolved around the plan to complete a comprehensive study of the basin taking all management aspects and conditional variables into the study. This was an acceptable approach. I recognize, as has the Corps, that it would take time but a full scientific review is necessary. There are simply too many issues and variables involved to fully list them all here which will impact water level management at drought level 4. Many have been previously discussed in writing to the Corps associated with the previous EA.

I cannot understand how a permanent change of this significance to all SRB stakeholders can be implemented as a result of an Environmental Assessment. This magnitude of change should only be implemented via results of an Environmental Impact Statement (EIS) and/or other comprehensive study of the complete basin. Significant alternative recommendations should also be included for review.

It is certainly much wiser to begin managing water levels at drought levels 1, 2 and 3 as soon as a drought is predicted and/or has been defined. The State of South Carolina DNR Drought Response Act states that "During a drought declaration, the use of water from a managed watershed impoundment shall not be restricted **as long as minimum streamflow or flow equal to the 7Q10 is maintained**, whichever is less." It also states that instream flows less than the 7Q10 rate may be insufficient to adequately assimilate waste loads and can result in water-quality standards violations. It has not been identified in the EA, or any other studies I am aware of, exactly what the acceptable 7Q10 rate is in any of the lakes at any low lake water level, regardless what drought level we are in. Many stakeholders have been asking for a study to determine flow rates. There will certainly be flows present and much less water when the lakes drop significantly. It is very difficult to understand how a "***Finding of No Significant Impact*** (FONSI)" can be an accurate finding without that data.

The high probability of impaired water quality in the lakes due to low water levels must be part of the consideration for management of level 4 impacts (and of course, any level). There are thousands of water users of these lakes that may be subject to illness due to unhealthy drinking water. The main issue being the the inability to adequately assimilate waste loads. It just makes sense to avoid reaching that situation by slowing water discharges immediately upon recognizing a drought condition exists. It is my belief that a completely revised process to manage lake levels is necessary.

Please reconsider your results and consider further efforts to implement an EIS or other basin flow management study as soon as possible to resolve this major lake level management concern.

Thank you.

Michael Massey
Co-chairman, SC Savannah River Basin Advisory Council
103 Shady Lane
Anderson, SC 29625
864-222-1925

Betty Holdman-Phone Message

Left message saying she is in favor of the change in Winter Level 4 drought operations to 3100 cfs from 3600 cfs.

APPENDIX N

SUMMARY OF COMMENTS RECEIVED

AND

RESPONSES TO COMMENTS

Summary of Comments Received on Draft EA
(14 June 2011-14 July 2011 Public Comment Period)

Upon distribution of the Savannah River Basin-Level 4 Drought Operations Draft EA on June 14, 2011, Savannah District received 26 written letters, e-mails and dictated responses from Federal and state agencies, environmental groups, civic organizations and private citizens.

There were 13 respondents that provided general statements in support of the action. These respondents were the SC Department of Natural Resources, GA Department of Natural Resources, SC Department of Health and Environmental Control, U. S. Geological Survey-SC Water Science Center, GA Historic Preservation Division, Lisa Kishoni, James Hermann, Jay Pondy, Keitt Wilson, Choctaw Nation of Oklahoma, Beaufort-Jasper Water and Sewer Authority, Georgia State Clearinghouse and Betty Holdman.

Of the remaining 13 respondents, many submitted more than one comment. These respondents were Savannah River Nuclear Solutions, Southern Environmental Law Center, Lake Hartwell Association, Friends of the Savannah River Basin, Environmental Protection Agency (Region 4), U. S. Fish and Wildlife Service, Joseph Brenner, The SC Archives and History Center, NOAA-National Marine Fisheries Service, Sam Booher, Anderson Area Chamber of Commerce, SC Savannah River Basin Advisory Council and GA Department of Natural Resources-Coastal Resources Division.

The District received a total of 83 comments including the 13 general statements in support of the action. The remaining 70 comments have been addressed. These comments and resulting responses are included in this Appendix.

Public Comment- Savannah River Nuclear Solutions (SRNS)

01-LO-02-EN01

Comment: "*SRNS supports a reduction in the discharge rate of water from Thurmond Reservoir, as proposed in the draft EA. However, as we have commented in previous years when such a reduction has been proposed, SRNS is concerned that the USACE will not increase the discharge rate unless a request is made by either a South Carolina or Georgia agency. If the river level at the Savannah River Site (SRS) pump intakes falls low enough to jeopardize withdrawal, SRNS may require a quick response from the USACE to correct the situation. Although SRNS anticipates that South Carolina would respond appropriately, it is not clear that the process would work quickly enough to prevent problems. If SRS cannot withdraw water from the Savannah River, significant operational, safety, and environmental problems would likely result. SRNS requests that the EA be revised to allow river water users (withdrawers) to make a request directly to the USACE to increase the release rate from Thurmond Reservoir, as needed, to prevent significant operational, safety, or environmental problems."*

Response: USACE will accept a request from SRS to increase flows during a 3,100 cfs flow window. If the District receives such a request, it would coordinate with the States as part of its evaluation of whether to increase flows at that time. The SOP will be changed to reflect this.

01-LO-02-EN02

Comment: "*It should be noted that the Thurmond Reservoir release rate during December 2008 and January 2009 averaged less than 3,100 cfs, although the revised EA stated that it would be maintained at 3,100 cfs. SRNS understands that it is impossible to maintain a constant discharge rate of 3,100 cfs; however, it should be possible to maintain an overall average close to 3,100 cfs. The flow was above 3,100 cfs only 15 out of 61 days and the average flow was less than 3,000 cfs during this two month period. An extra 100 cfs could have significant operational impact to river water withdrawers and could improve instream water quality during periods of severe drought."*

Response: USACE will target a minimum daily average release of 3,100 cfs during the reduced discharge period. Care will be taken to ensure streamflows at the SRNS intake site exceed 3,600 cfs. The Plant Vogtle gage will be used as the target site.

Public Comment- Southern Environmental Law Center

02-TJ-08-EV01

Comment: *"Additionally, we wish to point out that by independently proposing changes to its operations first for Level 1 and 2 and then for Level 4, the Corps is engaging in impermissible segmentation of the National Environmental Policy Act (NEPA) process. Thus, we request that the Corps undertake a comprehensive examination of all of its drought level contingencies on the Savannah River and incorporate this analysis in an environmental impact statement (EIS)."*

Response: The District does not concur. This proposal was not removed from other work to avoid doing an EIS, so segmentation did not occur. The District had previously proposed temporary revisions to Levels 1-3 of the Drought Contingency Plan in response to an ongoing drought. The present proposal is to actions that would be taken in Level 4 and would be a permanent change to the Drought Contingency Plan. The GAO suggested in 1989 that the Corps evaluate Level 4 operations.

02-TJ-08-EV02

Comment: *"If the Corps has abandoned any proposal to alter its operations for drought levels 1-2 and has no plans to change its operations for level 3, then the current proposal should reflect those decisions. If further changes are anticipated, then this proposal should state as much. In either case, flow changes on the Savannah of the magnitude contemplated need to be comprehensively discussed in an EIS."*

Response: The District is not presently evaluating any modifications to drought Levels 1-3. If the Savannah River Basin Comprehensive Study is resumed, the District expects those evaluations would be conducted. However, since financial participation from non-Federal sponsors is required, the District has no certainty if or when that study would be resumed. The District continues to believe that the proposed revision to the Drought Contingency Plan would not result in environmental impacts that warrant preparation of an EIS.

02-TJ-08-EN01

Comment: *"In times of drought, the limits of the river to serve those roles become quite, apparent. For example, unless sufficient flow is in the river to push back against the tidewaters of the Atlantic, drinking water intakes in Savannah, as well as thousands of acres of freshwater wetlands, can become overcome with saltwater. Similarly, the ability of the estuary to assimilate municipal and industrial wastes in severely tested during periods of low flow. Moreover, the corps needs to take into account future water supply withdrawals such as those that would be required for an expanded Plant Vogtle. To protect the Savannah River, the Corps must analyze and manage this river holistically. Interests upstream should not be allowed to trump those downstream and vice versa. The Savannah River is a natural resource of tremendous value both ecologically and economically. It is ours to collectively protect or to separately ruin. If the Corps loses site of the myriad interests in the river, the latter is sure to occur."*

Response: Similar to the Augusta Canal Diversion, USACE has no regulatory authority over water withdrawals from the river. The minimum flows from the reservoir system during drought are used in the state permitting process for water withdrawal intakes and point source discharges. Typically wintertime is less biologically active, there is more baseflow from Thurmond to downstream points of interest, and dissolved oxygen levels are generally sufficient to meet water quality standards. These are some of the reasons why the winter window of November to February was chosen for the flow reduction to conserve inactive storage.

As the river becomes more developed, additional withdrawals are likely to occur. A holistic approach to water management in the basin requires a holistic collaboration effort among regulatory, water management, and natural resource management agencies to preserve in the integrity of the resource. In the future there will be continued need for the State water resource agencies and US Fish and Wildlife Service to enforce their regulatory authorities to ensure adequate water quantity and quality for downstream habitats.

02-TJ-08-EV03

Comment: *"The Corps has provided no data in the DEA that would support a finding of no significant impact as to fish and other aquatic organisms. In the following passage from an appendix to the DEA, Corps admits that there is a lack of data to determine effects of the proposed reduced flows on the river's aquatic community."*

Response: Savannah District relied on the information that is presently available to prepare the document.

02-TJ-08-EV04

Comment: *"Flow levels and temperature regimes also provide cues for initiating migrations and physiological changes in preparation for spawning. After spawning, flow and temperature regimes have significant effects on early life stage development and survival. This holds true for the Savannah River. In fact, research has indicated the Savannah River's population of shortnose sturgeon has not benefitted by any natural recruitment in recent decades. This has been attributed to loss of spawning and rearing habitat from Corps dam construction and the disruption of natural processes including the altered flow regimes from Corps dam opererations. The robust redhorse and other freshwater species are also in severe decline due to the same factors."*

Response: The Corps disagrees with some of the commentor's statements, as juvenile shortnose sturgeon have been found recently in the Savannah River, so some level of natural recruitment is likely.

02-TJ-08-EV05

Comment: *"The Corps and certain state agencies allegedly have an agreement that maintaining stable pool elevations in the reservoirs to encourage largemouth spawning should be a priority*

in water management decisions. In times of drought, this could mean that downstream threatened and endangered diadromous and freshwater species in the Savannah River would have to suffer at the expense of the upstream sport fish. Furthermore, a decline in endangered organisms like the sturgeon signals an overall decline in the health of the Savannah River ecosystem."

Response: The State natural resource agency bass spawning priorities are included in Section 2.8.8.

02-TJ-07-EN02

Comment: *"The Corps has Overestimated the Augusta Shoals Flow Levels. This will have significant impacts to fish currently using the Augusta Shoals as spawning habitat. One component of the mitigation proposed as part of the Savannah Harbor Expansion Project (SHEP) is that the Corps would install a fish passage structure at the New Savannah Bluff Lock and Dam (NSBL&D). The intent of this structure would be to allow diadromous and freshwater fish to gain access to the shoals for spawning. In light of this, it is imperative that the shoals receive an appropriate flow both during the January to February period to stimulate migration river and during the March to May period to allow spawning in the shoals. This amount is likely to prove to be far more than the 1,500 cfs that the proposed plan would afford them."*

Response: USACE has no regulatory authority over the quantity of downstream withdrawals or diversions which may have an negative impact on water quality or water supply. The State water resource agencies have the regulatory authority to enforce water quality standards and agreements with the City to ensure adequate water quality for downstream habitats. The City of Augusta has installed a backup set of diesel-powered pumps to use in place of the hydro-mechanical pumping system. They indicate the new pumps will give them more operational flexibility during severe drought conditions. Implementing the Proposed Action will not affect the success of fish passage at the NSBL&D. The Proposed Action would reduce discharges during the winter months, prior to the Shortnose sturgeon spawning period. The flow reduction would extend into February only if NOAA Fisheries concurs that the action would be acceptable and not adversely impact Shortnose sturgeon.

02-TJ-08-EV06

Comment: *"In recent years, the Corps has implemented flow reductions similar to the one proposed here. It is likely that the Corps will propose similar actions in the future as pressure on water resources increases. This leads to the necessity for the Corps to adopt a strict flow schedule that prioritizes the needs of diadromous and freshwater fish below Corps facilities on the Savannah River and to explore alternative actions instead of simply reducing flows from JST to offset storage loss in the reservoirs. If the shoals do not receive sufficient water, it will be even more difficult for SHEP mitigation to provide benefits to shortnose sturgeon."*

Response: The Corps has and will continue to consider potential impacts to diadromous and freshwater fish in the Savannah River in its evaluations of proposed changes in releases from Thurmond Dam.

Public Comment- Lake Hartwell Association

05-TJ-01-EV01

Comment: *"The Lake Hartwell Association cannot endorse the recommended changes as defined in the Draft Savannah River Basin Level 4 Drought Operations Study Environmental assessment (EA) not do we agree with the Draft Finding of No Significant Impact (FONSI, as stated in the document. If water levels drop anywhere close to Drought Level 4 there is a very high probability of a significant impact to the people using water from Hartwell Lake. One of the most significant impacts could be an impaired quality of water creating a potentially dangerous health situation for many thousands of users. This possibility requires a detailed technical analysis of Hartwell Lake water issues at Drought Level 4. Many steps can be take at earlier drought levels to greatly reduce or eliminate this possibility."*

Response: Potentially revising Corps actions at earlier drought levels is not part of this study. Savannah District expects to evaluate the entire Drought Contingency Plan in the next phase of the Savannah River Basin Comprehensive Study. If implemented, the action presently being proposed would slow the decline of the lake elevations when in the severest of droughts, Level 4, when compared to the No Action Alternative.

Public Comment- Friends of the Savannah River Basin

06-TJ-12-EN01

Comment: *"The Joint Public Notice makes no mention that the EA also contains a previously unseen description of the operation of the Lake system when in Level 4. This analysis of this critical situation (using the inactive storage of each lake) has long term impacts and consequences that cannot and should not be judged alone but only as part of the impending drought plan study. Any analysis requires far longer than a standard 30 day response and major participation by the States and basin stakeholders."*

Response: The rules applying to releases in drought Level 4 are described in the 1989 Savannah River Drought Contingency Plan which specifically states that in Level 4, USACE will continue to release 3,600 cfs from Thurmond for as long as possible and then outflow = inflow. "As long as possible" means as long as there is storage remaining or there is no longer a way to release the water in storage. This is the base condition from which other alternatives presented in the EA were compared to identify and evaluate effects.

06-TJ-12-EN02

Comment: *"The operational concept contained in the EA would allow the extreme lowering of the Lakes and continued operation in the inactive storage domain. As a result major impacts to water users, industry, municipal water supplies, private property owners, wildlife are inevitable thereby requiring a full Environmental Impact Statement. It is also unclear how long lasting are these effects when conditions improve."*

Response: If implemented, this proposal would slow the drop of the lake elevations when in the severest of droughts, Level 4, when compared to the No Action Alternative. The proposed reduction would only occur when in Level 4. The relative impact of reducing flows from 3,600 cfs to 3,100 cfs during the winter is considered a minor adverse impact to downstream aquatic resources in the EA. The current no action alternative (without the EA) consists of releasing 3,600 cfs for as long as possible, thereafter outflow equals inflow. The alternative proposed is a storage conservation approach to extend the period over which the inactive storage would be depleted if a record breaking drought persisted for an inordinate amount of time. The probability of this extreme drought event continuing for nine years is extremely low.

06-TJ-12-EV01

Comment: *"There is confusion about what is the general operational concept should the lakes conservation pools ever be exhausted. The general consensus is that it is output=input. It is recognized that the Action Level Table in the 1989 Drought Plan states: continue Level 3 discharge as long as possible, thereafter Outflow = Inflow. However Table 8: Hartwell and Thurmond Action Levels for Alternative 2 in the 2006 Drought Level EA states for level 4: Daily Average Outflow = Daily Average Inflow."*

Response: The rules applying to releases in drought Level 4 are described in the 1989 Savannah River Drought Contingency Plan which specifically states that in Level 4, USACE will continue to release 3600 cfs from Thurmond for as long as possible and then outflow = inflow. "As long as possible" means as long as there is storage remaining or there is no longer a way to release the water in storage. This is the base condition from which other alternatives presented in the EA were compared to identify and evaluate effects.

06-TJ-12-EV02

Comment: *"The discussion of operation in Level 4 is inconsistent with two of the objectives of Drought Management in the 1989 plan:*

- *The reservoir levels should not be drawn below the bottom of the conservation pool*
- *Make use of most of the available storage in the reservoirs during the drought-of-record. They should not be drawn down entirely, though, as a contingency against a drought that exceeds the drought of record."*

Response: The proposed action addresses the unforeseen drought that exceeds the drought of record. Should an event of this magnitude occur, this SOP clarifies the way in which the Corps would operate the system (including the amount of water released from Thurmond Dam) and establishes a priority in how the remaining storage would be drafted below the conservation pools.

06-TJ-12-EV03

Comment: *"There has been enough change and/or deviations in the 1989 Drought Plan that a total rewrite should be done to eliminate any ambiguities and uncertainties. This is what the States have requested in the impending study."*

Response: This particular proposal addresses concerns expressed by the public in the past, as well as a suggestion by the US General Accounting Office to study a strategy to address the potential drought situation in which lake levels fall below the bottom of the conservation pool. The emergency funds obtained to conduct this study do not allow examination of the entire Drought Contingency Plan, but only actions during extreme Level 4 drought conditions. The Corps intends to examine the entire Drought Contingency Plan during the next phase of the Savannah River Basin Comprehensive Study, if that study is resumed.

06-TJ-12-EV04

Comment: *"The EA only provides "lip service" to the request from the states in the 2006 EA: The water users should identify ways (e.g. local engineering measures) of avoiding or mitigating impacts of such flow reduction and communicate such measures as well as the costs of such measures to the Corps and the States."*

Response: The Corps believes that the State's 2006 suggestion is a good one that would allow the water withdrawal users to be better prepared for severe drought conditions.

06-TJ-12-EV05
Comment: *"In the discussing the relationship to ongoing actions, the section on Savannah Harbor does not fully address the many concerns that have been submitted as part of the SHEP EIS. Also there is no discussion of the impact of the significant reduction in the DO TMDL in the lower river required by the EPA (this could potentially help mitigate the impact of lowered DO in the warmer months and support lower flows)."*

Response: This EA can only address currently available information. The evaluation cannot know with certainty what changes EPA may make to the DO TMDL for Savannah Harbor. EPA's stated intent for their proposed revised DO TMDL is not to encourage additional reductions in flow, but is instead intended to allow the river to meet the States' DO standards.

06-TJ-12-EV06
Comment: *"The EA does not supply any data that addresses whether there are any public health issues concerning the releasing of inactive storage water down the Savannah River and the overall water quality of these releases."*

Response: Section 2.6 provides the information known about water quality on the reservoirs. If implemented, this proposal would slow the drop of the lake elevations when in the severest of droughts, Level 4, if compared to the No Action Alternative.

06-TJ-12-EV07
Comment: *"The EA dismisses the alternative of output=input with one short paragraph delineating a list of general impacts with no analysis."*

Response: The rules applying to releases in drought Level 4 are described in the 1989 Savannah River Drought Contingency Plan which specifically states that in Level 4, USACE will continue to release 3600 cfs from Thurmond for as long as possible and then outflow = inflow. "As long as possible" means as long as there is storage remaining or there is no longer a way to release the water in storage. This is the base condition from which other alternatives presented in the EA were compared to identify and evaluate effects.

06-TJ-12-EV08
Comment: *"The EA uses an assumed 50-50 approximation for the diversion into the Augusta Canal affecting flows to the environmentally sensitive upper portion of the shoals. The pending FERC license agreement has not yet been approved and the Corps has no way to force this."*

Response: USACE encourages the US Fish and Wildlife Service, NOAA Fisheries, and GA DNR-EPD to exercise their authorities and agreements over the diversion that occurs at the Augusta Canal. Those agencies have entered into an agreement with the City of Augusta that would ensure adequate minimum flows in the Augusta Shoals.

06-TJ-12-EV09

Comment: *"The last three droughts have each been a new drought of record. The most recent drought that began in 2006 caused the Lakes to drop faster than any previous drought of record. It is clear that significant changes in the Drought Management need to be made and lessons learned institutionalized. This includes a comprehensive reassessment of the actions taken early in a drought condition given the catastrophic consequences to the entire SRB of getting to an inflow equals outflow condition."*

Response: Such an assessment is outside the scope of this Emergency Drought Study.

06-TJ-12-EV10

Comment: *"Administrative Comments*

- *Table 7: apparent errors in conversion of days to years conversion in last 6 entries*
- *Table 8: apparent errors in conversion of days to years for most of the entries*
- *Para 4.9 Hartwell Lake: Typo in 2nd to last sentence Hartwell spelled wrong*
- *Para 4.9 JST Lake: Cut and paste error in 2nd to last sentence: Copied misspelling of Hartwell into JST paragraph"*

Response: Edited as noted.

Public Comment- EPA, Region 4

07-LO-13-EV01
Comment: "*On page 38, (2.12. HTRW), the term "HTRW" is a term specific only to the Corps of Engineers' vernacular and could be confusing for the average citizen. EPA recommends that Savannah District spell out this acronym as "Hazardous Toxic Radioactive Waste"."*

Response: As suggested, the District has revised the acronyms list to define the term "HTRW".

07-LO-13-EV02
Comment: "*The Corps discusses an "extensive collaboration" with other state and Federal resource agencies (page 39, 3.1 Alternative Formulation). What is the extensive collaboration initiative that the Savannah District that is referenced? What state and Federal agencies, non-profit organizations and businesses groups were represented in this collaborative effort? Is this collaborative effort still active? Since the Corps is relying on this initiative to base the assumption that the Federal and state resource agencies are supportive of the proposed action, then the Corps should briefly describe this program to include member representatives and findings. EPA recommends the Corps describe and document either within the body of the EA or an appendix the composition, mission and any pertinent findings of this collaborative effort."*

Response: The paragraph after the referenced paragraph contains the agency names. Appendices C and D contain the recommendations that the Corps has received.

07-LO-13-EV03
Comment: "*The Corps states that the State agencies are supportive of the reduction in wintertime flow (page 51, 3.2.2. Alternative 1, first paragraph). What state agencies are supportive of this action? Appendix G (Georgia Department of Natural Resources Environmental Protection Division Summary of Findings 2008 3100 CFS Discharge, dated June 22, 2009) refers to findings by Georgia EPD, South Carolina DHEC and South Carolina DNR. EPA recommends that the Corps reference Appendix G in the 3.2.2. Alternative 1 section of the EA. Also, is the Georgia Wildlife Resources Division (WRD) supportive of the preferred Alternative? If so, this should be documented within the EA and supported by written communication. EPA recommends that the Corps discuss the disposition of the Georgia WRD within the text of the EA."*

Response: Please see the Agency recommendation letters in Appendix D from GADNR, SCDHEC and SCDNR. We have received a concurrence letter from GADNR.

07-LO-13-EN01
Comment: "*The Corps discusses the member composition Savannah River Basin Drought Coordination Committee (SRBDCC) (page 51, 3.2.2. Alternative 1, first paragraph); however, no mention was made of the U.S. Fish and Wildlife Service (USFWS) or NOAA-National Marine Fisheries Service (NFMS). Table 14: Offices Representing Agencies lists different agencies, but there is no mention of Georgia WRD or USFWS. Given the sensitive nature of the estuary habitats (including the Savannah National Wildlife Refuge) and endangered species, it would*

seem important to include these resource agencies on any drought operations decisions. EPA recommends that USFWS, NMFS and Georgia WRD be invited to participate on the SRBDCC. If these agencies have been invited to participate and have declined participation, then the Corps should explain their attempts to include these agencies in the body of the EA."

Response: USACE has added the US Fish and Wildlife Service and NOAA-NMFS to the list of participants of the SRBDCC. Those agencies have regularly participated in that group and their non-inclusion was an oversight. The 1989 DCP states in the responsibilities of the SRBDCC section that "coordination will also be maintained with the USFWS and the NMFS to assure impacts to fish and wildlife resources are considered." Likewise, as a member of the SRBDCC, GA DNR-EPD would need to maintain close coordination with GA DNR-Wildlife Resources Division (WRD) to ensure fish and wildlife impacts are considered during drought management activities.

07-LO-13-EV04

Comment: "*The Corps discusses impacts to the Augusta shoals in relationship to the Augusta Canal and reduced flows stating, "The amount of flow reduction is expected to result in minor effects to those biotic communities (page 72, Effects of Recommend Alternative, third paragraph)." The Corps anticipated a reduction of 250 CFS (from 450 CFS, which would be 200 CFS or a 44% decrease in flow) over the Augusta Shoals. The Corps claims that this would not adversely affect anadromous species because the species would unlikely be within the shoals during the winter months when flows are proposed to be reduced. There is no discussion in the EA as to the USFWS, NFMS, SCDNR or GADNR's opinion on the impacts of this 44% decrease in flow over the Augusta Shoals. EPA recommends that the Corps consult with USFWS, NFMS, SCDNR AND GADNR regarding the potential impacts to the Augusta Shoals. EPA further recommends that a discussion be added to the Effects of Recommended Alternative section and explain the views of these resource agencies."*

Response: The Corps sought the views of those agencies as part of its coordination of the Draft EA. Each of those agencies provided comments on the Draft EA and the proposed action This action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs. USACE has encouraged Augusta to meet their proposed diversion agreement with USFWS, however, USACE has no regulatory authority over the quantity of downstream withdrawals or diversions which may have an negative impact on water quality or water supply. The State Water Resource agencies have the regulatory authority to enforce water quality standards to ensure adequate water quality for downstream habitat. USACE encourages US Fish and Wildlife Service and GADNR-EPD to exercise their regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in Augusta Shoals.

07-LO-13-EV05

Comment: "*The Corps briefly discusses the Savannah National Wildlife Refuge (NWR) in 4.5 Biotic Communities-Estuary (page 75) section of the EA; however, there are no specific impacts discussions mentioned in the Effects of Recommended Alternative sections. What are the*

potential impacts of the reduction of flow? Has the Corps consulted with the USFWS regarding impacts to Savannah NWR? If so, is the USFWS supportive of the decreases? EPA recommends that the Corps consult with the UFWS regarding potential impacts to the NWR. Additionally, EPA recommends that the Corp include a more thorough discussion of potential impacts to the NWR as well as discuss the USFWS views (positively or negatively) toward the preferred alternative. "

Response: The Corps sought the views of the USFWS as part of its coordination of the Draft EA. The Service provided comments on the draft EA and the proposed action, including comments pertaining to the Savannah National Wildlife Refuge. The expected impacts of going to 3,100 cfs during the winter months (November-February, or November-January if NMFS elects due to shortnose sturgeon) are temporary and eventually normal flows would be expected to return. This action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs. As part of the SRBDCC, the Corps would coordinate closely with the USFWS if we reach Level 4 drought conditions and implement the proposed action.

07-LO-13-EV06

Comment: "*The Corps states that "…439 acres of freshwater marsh could undergo temporary adverse effects due to higher salinity as a result of Alternative 1." Are the 439 acres all in the Savannah NWR and if not, where are these 439 acres and who are the land owners? As with the previous comment, if these marshes are located in the Savannah NWR, EPA recommends the Corps consult closely with the USFWS (as well as other land owners) as well as the Georgia Coastal Resources Management Division and include their concerns in the discussion of the EA."*

Response: The Corps sought the views of those agencies as part of its coordination of the Draft EA. Each of those agencies provided comments on the draft EA and the proposed action. The expected impacts of going to 3,100 cfs during the winter months (November-February, or November-January if NMFS elects due to shortnose sturgeon) are temporary and eventually normal flows would be expected to return. This action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs. As part of the SRBDCC, the Corps would coordinate closely with the USFWS if we reach Level 4 drought conditions and implement the proposed action.

07-LO-13-EV07

Comment: "*The Corps has made the determination that the preferred alternative "may affect, but not likely to adversely affect the shortnose sturgeon, manatee and wood stork. (page 83, Effects of Recommended Alternative)." It appears that the USFWS concurred with the Corps effects determination (reference USFWS letter dated June 4, 2009, Savannah River flow recommendations below Thurmond Dam FWS Log No. 41460-2009-FA-0650). Given that this determination is over 2 years old, does the Corps intend to consult with the USFWS? EPA recommends that the Corps engage the USFWS to ensure that there are no new listed species in the affected area and ensure conditions for previously listed species have not changed. Also, as noted in the USFWS letter dated June 4, 2009, the shortnose sturgeon falls under the authority of*

the NFMS; however, there is no written concurrence from NFMS regarding the shortnose sturgeon. There is a NFMS letter included in the supporting documentation (letter dated June 24, 2009), but it is unclear if this is an effects determination concurrence letter. Section 7 of the Endangered Species Act and ER 1105-2-100, Appendix C, (page C-8) requires the written concurrence from USFWS or NFMS (as appropriate) regarding any "may affect, not likely to adversely affect" determinations. Again as with the USFWS determination letter, EPA recommends that the Corps contact the NFMS to ensure that there are not other listed species in the affected area and receive written concurrence from NFMS regarding the Corps' effects determination. Additionally, EPA recommends that any supporting documentation be referenced in the body of the EA."

Response: Coordination was initiated on 14 June 2011 with USFWS and NMFS and they both have responded. Text has been added to the EA in reference to both.

07-LO-13-EV08

Comment: "*The USFWS letter dated June 24, 2009 states, "In light of these concerns, and without our critical research needs addressed, we do not recommend a flow reduction to 3,100 cfs. Both the long duration and timing of the protracted period would be of concern. Additionally, if implemented in 2009, the proposed reduction would be in addition to recent long-term, low-flow conditions, which could exacerbate environmentally stressful conditions and amplify otherwise negligible biological impacts." It appears that none of the USFWS concerns were addressed in the EA. Does the Corps intend to mitigate for any of these habitat loses? EPA recommends that the Corps fully disclose the USFWS concerns in the EA as well as work closely with USFWS and NFMS to mitigate habitat losses due to reduced flow."*

Response: The Corps believes that the minimal impacts expected from the proposed action do not warrant mitigation. As part of the SRBDCC, the Corps would coordinate closely with both the USFWS and the NMFS if we reach Level 4 drought conditions and implement the proposed action.

07-LO-13-EV09

Comment: "*The Corps doesn't discuss the impacts regarding sports fishing downstream of the Thurmond in 4.8 Recreation (page 84). Will reduced flows impact sport fishing? EPA recommends discuss any impacts to fishing downstream of the dam in the EA."*

Response: The reduced flows will not substantially impact sport fishing. Flows would remain within the main channel for both 3600 and 3100 cfs releases, so fishing area would be minimally changed. Boat access is expected to be adequate for both 3600 and 3100 cfs releases. The flow reduction would occur in winter when recreational fishing use is low.

07-LO-13-EV10

Comment: "*It appears that the Corps has made a determination that the preferred alternative is consistent with Coastal Zone Management Act (CZMA) state plans; however, there is no supporting documentation (written concurrence) that the states of Georgia and South Carolina have concurred with their determination. EPA recommends that the Corps engage the states of*

Georgia and South Carolina to ensure the preferred action is consistent with their respective CZMA plans. Additionally, EPA recommends a more robust discussion regarding the state of Georgia and South Carolina's recommendations regarding coastal zone impacts."

Response: Coordination has occurred. CZM concurrence has been received from the State of South Carolina.

07-LO-13-EC01

Comment: "*There is no socio-economic impacts discussion within the EA. The preferred alternative could possible increase or help sustain economic impacts within the lakes. The higher lake levels would encourage and sustain recreation, which are important economic drivers in local communities. Also, what are the economic impacts to businesses downstream of the lake. For example, will reduced flows impact industrial plants and other businesses such as the Vogtle Power Plant that relies on adequate water for operational withdrawals? Will the reduce flow impact businesses that have NPDES permits that might have to reduce discharges to meet state water quality standards? It would appear that reducing flow could have both positive and negative impacts to local businesses that rely upon the Savannah River system. EPA recommends that the Corps conduct a thorough socio-economic analysis regarding the preferred alternative's impacts to the local communities impacted."*

Response: The proposed Level 4 Drought Operation is based on first attempting to meet drinking water requirements for the most people possible for the longest period of time possible, while secondarily attempting to meet environmental quality requirements for as long a period as possible. Without the proposed action, it is estimated that businesses and industries downstream would experience minimal river flows -- where outflow equals inflow -- 600 days earlier than with the proposed alternative. In other words, the alternative management strategy extends the period of flows that would keep businesses and industries operational for an additional 600 days. Savannah District and other potentially affected parties would work with the State of Georgia and South Carolina, who will monitor a prescribed set of locations, parameters and general performance targets. If measured parameters exceed acceptable levels and the State of Georgia or South Carolina requests Savannah District restore discharges, the District would restore the discharge up to 3,600 cfs.

07-LO-13-EV11

Comment: "*The Corps does not discuss Climate Change in the EA. CEQ recently released draft guidance (Draft NEPA Guidance on Consideration of the Effects of Climate Change and Greenhouse Gas Emissions, dated February 18, 2010, http://www.whitehouse.gov/sites/default/files/microsites/ceq/20100218-nepa-consideration-effects-ghg-draft-guidance.pdf) requesting agencies to consider conducting climate change analysis within the NEPA process. The purpose of the guidance is to encourage Federal Agencies to, "(1) The GHG emissions effects of a proposed action and alternative actions; and (2) The relationship of climate change effects to a proposed action or alternatives, including the relationship to proposal design, environmental impacts, mitigation and adaptation measures."*

A climate change discussion could assist the Corps in justifying the need for reduce flow during times of drought. In fact, the proposed action could be viewed as an adaptive measure for addressing ever increasing drought conditions resulting from climate change. EPA recommends that the Corps discuss climate change relating to the proposed federal action."

Response: Climate Change was added to the list of issues at the beginning of Chapter 4 to which Savannah District does not anticipate an effect. Greenhouse Gas Emissions are not expected to be produced by the Proposed Action. Climate Change induced sea level rise could cause inland movement of the salinity gradient, but adaptive management described in the EA could be used if flows drop below 4500 cfs at a Clyo gage.

Public Comment- US Fish and Wildlife Service

12-TJ-21-EN01

Comment: *"Drought operations should not be solely based on reservoir levels. For example, ACOE operations in the Apalachicola-Chattahoochee-Flint (ACF) Basin and the Alabama-Coosa-Tallapoosa (ACT) Basin are not based on reservoir levels alone. Instead, drought operations should be based on triggers that include reservoir level thresholds, basin inflow, and climatic thresholds. Using only reservoir storage does not necessarily tie operations directly to drought conditions. For instance, water consumption, interbasin transfers, and/or ACOE hydropower operations could draw storage levels instead of true drought conditions. We recommend ACOE modify their drought operations triggers, and establish procedures for reductions in water use during periods of low inflow to ACOE and other reservoirs in the basin. These procedures should be developed on the basis that all parties with interests in water quantity will share the responsibility to establish priorities and to conserve the limited water supply. Such a set of procedures would establish trigger points and procedures for how the reservoirs will be operated; as well as, water withdrawal reduction measures and goals for other water users during periods of low inflow (i.e., periods when there is not enough water flowing in the reservoirs to meet the normal water demands while maintaining usable storage in the reservoir system at or above a seasonal target level.)"*

Response*:* This EA focuses specifically on operations in Level 4. USACE developed the drought levels for simplicity so that the public would not be misled or confused. The establishment of methodologies defining when to impose flow reductions before Level 4 is reached is outside the scope of this EA. Your suggested changes could be considered as alternatives in a future update of the entire drought plan. Storage is allocated in the Conservation Pool based on a continuous amount of water withdrawal from that source (i.e. 1 mgd). Sufficient storage is allocated in the Conservation Pool to that user to meet his demand over the worst drought of record. The water withdrawal users have no assurance of water after the reservoirs reach the bottom of their Conservation Pools. The framework described to reduced consumptive use while in Level 4 could extend the time during which some water may be available for their use, similar to the benefits of the proposed action.

12-TJ-21-EV01

Comment: *"The Draft EA states that when the reservoirs reach the Level 1 trigger elevation, ACOE issues a public safety advisory concerning recreational use of the reservoirs. As a similar action, we recommend that when the reservoirs reach levels 1-4 that ACOE also issue public advisories regarding the status of the reservoir levels and the need for the public to engage in reduced water consumption"*

Response: This action is limited to consideration of Level 4.

12-TJ-21-EV02

Comment: *"The alternatives analysis provided in the Draft EA included a no action alternative and the proposed action alternative that would reduce discharge from JSTD by approximately 14%. Although we recognize that a Drought Level 4 situation represents extreme and rare conditions, we emphasize to ACOE that this is the fifth occasion since late 2008 that ACOE has*

proposed to reduce discharges. The Service objected to previous discharge reduction proposals because of the anticipated level of adverse impacts to downstream resources. Potential impacts to downstream ecosystems are associated with each proposed flow reduction – these ecosystems have already been severely impacted or geographically limited by anthropogenic factors. Thus, we emphasize that any change to the DCP should include a proposed action alternative that reduces impacts to downstream environments less than the currently proposed action alternative. Measures to consider should include early water conservation, re-siting or modification of water intakes to prolong their use as reservoir levels recede, alternative operational strategies to ensure shoal and Savannah NEW freshwater inflows, and adequate discharge to ensure and maintain habitat for downstream species."

Response: This action could delay going to the next step: outflow = inflow, which could be as low as 300 cfs. The benefit of the proposed action is this delay in more severe environmental impacts downstream.

12-TJ-21-EV03

Comment: *"In the description of the proposed action and alternatives analysis, the Draft EA states, "the 2008 EA determined that it is possible to release as little as 3,100 cfs under specific conditions with an acceptable level of impact." Our subsequent correspondence with the ACOE provided direct evidence to the contrary. The flow reduction in 2008 severely reduced shoal inflow for large portions of the river shoal habitats for prolonged periods. The ACOE has not provided any additional details about this alternative to indicate that the system will be managed in a manner that ensures shoal inflow during this proposed flow reduction, making this alternative unacceptable."*

Response: USACE has encouraged Augusta to meet their proposed diversion agreement with USFWS. However, USACE has no regulatory authority over the quantity of downstream withdrawals or diversions. The State Water Resource agencies have regulatory authority to enforce water quality standards to ensure adequate water quality for aquatic habitats. USACE encourages GA DNR-EPD to exercise its regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in the Augusta Shoals. USACE also encourages the USFWS to exercise its agreement with the City of Augusta concerning the amount of water they divert down the Augusta Canal.

12-TJ-21-EV04

Comment: *"The analysis in the Draft EA examined the effects of the proposed and no action alternatives on storage depletion if 2008 inflows were encountered repeatedly over a 9-year period. Multiple consecutive years of extremely reduced flows could have potentially devastating impacts on population sizes of early spring spawning species (including shortnose and Atlantic sturgeon). However, if a flow reduction is implemented every other ear, thereby facilitating reproduction in alternate years, population-level effects are likely to be less severe. Similarly, providing sustained 3,100-3,600 cfs over a 9-year period is likely to result in lack of inflow and water exchange to river oxbow habitats for sustained periods and thereby incremental increases in terrestrial vegetation especially near oxbow-river junctions. The*

combined effects are likely to limit fish access to oxbow habitats as well as result in increased sedimentation of other main channel aquatic habitats, including potential adverse effects on the sessile organisms such as mussels. The ACOE analysis should give additional treatment to theses impacts, and propose alternatives (e.g., provision of occasional flow pulses as outlined in the Savannah River Ecosystem Flow Prescription) that could temporarily offset negative habitat effects (e.g., sediment accumulation, low dissolved oxygen, increase vegetation) associated with anthropogenically-prolonged low flow conditions. In summary, a modification of the DCP should consider interannual and intrannual variation in the implementation of discharges <4,000 cfs."

Response: The expected impacts of going from 3,600 to 3,100 cfs for the period of November 1 through the end of February (February only after receiving separate approval from NOAA-Fisheries due to concerns about potential impacts to shortnose sturgeon) while in drought Level 4 conditions are temporary and eventually normal flows would be expected to return. This annual action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs.

12-TJ-21-EV05

Comment: *"We have some specific edits and clarification on the status and distribution of the imperiled species in the Draft EA:*

- *On page 25, the robust redhorse (Moxostoma robustum) should be added to the fishery resources within J. Strom Thurmond Reservoir (JSTR).*
- *On page 32, the Georgia State-threatened Altamaha arcmussel (Alasmidonta arcula) and the South Carolina State-endangered brother spike (Elliptio fraterna) should be added and discussed in the Wildlife section.*
- *On page 34, the Atlantic sturgeon (Acipenser oxyrinchus) was included as a Federal Candidate species. This species was recently proposed as federally-endangered by the National Marine Fisheries Service (NMFS) in the Federal Register on October 6, 2010 (75 FR 61904).*
- *On pages 35-36, the Georgia State-threatened Altamaha arcmussel, South Carolina State-endangered brother spike, Georgia State-threatened Savannah lilliput (Toxolasma pullus), and Georgia State-endangered robust redhorse should be added to Table 6.*
- *On page 71, the brother spike should be included in the Augusta Shoals section.*
- *On page 82, the Altamaha arcmussel, brother spike, and Savannah lilliput should be included as threatened and endangered species that may be affected by the proposed action."*

Response: Information accepted for the Atlantic sturgeon. Proposed listings are not listed in the Table. Edits were made for the remainder.

12-TJ-21-EN02

Comment: ***"****On pages 20-23, the Draft EA references pumped storage operations and dissolved oxygen modifications involving JSTD and Richard B. Russell Dam (RBRD). It is our understanding that the dissolved oxygen injection system within JSTR has been completely installed and is operational; therefore, the information pertaining to the injection system, as well*

as the prior operating restrictions of RBRD that have now been removed, should be considered in the analyses and updated in the final EA. We appreciate ACOE's multiple actions to remediate dissolved oxygen problems that have been caused by your projects. Monitoring of the turbine venting projects at Hartwell Reservoir and JSTD has demonstrated significant improvements to downstream water quality."

Response: USACE will update info on the Thurmond oxygen system presented in this EA . However, this EA focuses specifically on Level 4 operations. The oxygen systems were not designed for operation at these pool elevations. USACE would continue to operate the oxygen systems as long as their operation proves beneficial.

12-TJ-21-EV06

Comment: *"On page 28-29, the Draft EA states that some species pass upstream by swimming through fully opened dam gates at flows of 16,000 cfs or higher. New information provided by South Carolina Department of Natural Resources (SCDNR) for American shad (Alosa sapidissima) indicates that flows of 24,000 cfs, instead of 16,000 cfs, are required."*

Response: The text was edited from 16,000 to 24,000.

12-TJ-21-EV07

Comment: *"In 2008, the City stated that they would provide 1,000 to 1,500 cfs in the shoals during JSTD releases of 3,600-3,800 cfs. However, 1,000 and 1,500 cfs in the shoals were only equaled or exceeded 40 percent and 20 percent of the time, respectively, during the 2008 implementation of the DCP deviation. Shoal inflow reached a record low (between 0 and 310 cfs) on November 10, 2008. While canal inflow averaged twice that needed to maintain Augusta's water supply, minimum shoal inflow resulted in a 70-100 percent loss of available habitat for fishes in the shallow-swift guild and fishes with similar habitat requirements to the robust redhorse (data sources: USGS gages and SRIF study). This is a significant impact that the ACOE did not foresee in the 2008 FONSI."*

Response: USACE has encouraged Augusta to meet their proposed diversion agreement with USFWS, however, USACE has no regulatory authority over the quantity of downstream withdrawals or diversions which may have an negative impact on water quality or water supply. The State Water Resource agencies and US Fish and Wildlife Service do have the regulatory authority to enforce water quality standards to ensure adequate water quality for downstream habitat. USACE encourages US Fish and Wildlife Service and GA EPD to exercise their regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in Augusta Shoals.

12-TJ-21-EV08

Comment: *"ACOE's Draft EA did not acknowledge these factors in its analyses and has not provided any evidence that the system will be managed in a better manner during this latest proposed flow reduction, making this alternative unacceptable."*

Response: USACE has encouraged Augusta to meet their proposed diversion agreement with USFWS, however, USACE no regulatory authority over the quantity of downstream withdrawals or diversions which may have an negative impact on water quality or water supply. The State Water Resource agencies have the regulatory authority to enforce water quality standards to ensure adequate water quality for downstream habitat. USACE encourages US Fish and Wildlife Service and GADNR-EPD to exercise their regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in Augusta Shoals.

12-TJ-21-EV09

Comment: *"A diversity of species are found in Savannah River oxbows, including the State-threatened Savannah lilliput and Altamaha arcmussel. On page 91, the Draft EA states that under Alternative 1, "Some sloughs and cutoff bends could be impacted by reduced flows. Mussels and other organisms in these areas could experience adverse effects. Given the overall project area, these localized occurrences would be minimal." These "localized" areas are the only areas in the Savannah River where these two species have been located. Therefore, while these locations may not encompass a large geographic area, they are extremely important habitat as they serve as the only habitat in the Savannah River for several State-listed species. As stated previously, the prolonged duration of low flows are likely to limit fish access to oxbow habitats as well as result in increased sedimentation of aquatic habitats, likely having adverse effects on sessile organisms such as mussels. Therefore, we do not agree with ACOE's conclusion that the effects on these areas would be minimal."*

Response: The expected impacts of going from 3,600 to 3,100 cfs for the period of November 1 through the end of February (February only after receiving separate approval from NOAA-Fisheries due to concerns about potential impacts to shortnose sturgeon) while in drought Level 4 conditions are temporary and eventually normal flows would be expected to return. This action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs.

12-TJ-21-EN03

Comment: *"The model results used in the analysis of potential flow reduction effects indicates salinity increases of < 1 parts per thousand (ppt) would occur at the I-95 bridge for reductions from 3,600 cfs to 3,100 cfs. Although the intake for the Freshwater Diversion Canal is located on the Little Back River, it is over five river miles downstream of the I-95 bridge. In reviewing salinity data for the USGS monitoring station at Lucknow Canal, which is less than two river miles below the intake, Savannah NWR is already experiencing salinity spikes up to 3.2 ppt during the critical months of October - January. The flow at Clyo during these periods is much less than the lower recommended range of 6,000 cfs as stated in the Service's 2003 FWCA report. We agree with the Draft EA where it states "river flows of 4,000 to 5,000 cfs and less at the USGS Clyo gage, have resulted in a stressed freshwater marsh plant community and an associated upriver shift of the salinity gradient (higher salinity zones)." The lack of precipitation associated with a Level 4 drought would most certainly result in flows at Clyo less than 5,000 cfs and, in all likelihood, less than the predicted flows for Alternative 1 (see Table 17, Draft EA). Small increases in salinity on a repetitive cycle within Savannah NWR's managed freshwater impoundments will have deleterious cumulative effects on the vegetation that is necessary to*

fulfill Savannah NWR's mandate to provide high-quality habitat for wetland-dependent migrant birds. To further reduce flow in an already stressed environment, could potentially have more severe and prolonged negative effects on the Savannah NWR and its ability to fulfill its mandated mission."

Response: USACE will work with Savannah NWR to target adequate freshwater flows at Clyo. USACE may restore flows back to 3,600 cfs during the proposed flow reduction periods in an attempt to ensure low salinity during periods of filling the Refuge impoundments.

12-TJ-21-EV10

Comment: *"Over 60% of the tidal freshwater wetlands originally within the Savannah River estuary have been lost from the movement of the salinity gradient upriver because of harbor expansions and upriver flow reductions. The majority of the remaining tidal freshwater wetlands are located on the Savannah NWR. The Draft EA states that only "439 acres of freshwater marsh would undergo temporary adverse effects due to higher salinity as a result of Alternative 1." This statement is misleading. The loss or degradation of any wetland acreage is significant since so much of the tidal freshwater wetlands within the estuary has already permanently lost. The effects of even temporary saline water on freshwater marsh plant communities are not easily or quickly reversed within the impoundments. Several years of saturation with fresh water (<0.5 ppt) are required to restore the integrity of the freshwater community within the managed impoundments. Reduced freshwater flows from reservoir discharges will further weaken an already tenuous hold on the managed wetlands within the Savannah NWR that provides sanctuary for an average of 23% of South Carolina's wintering waterfowl as well as a number of other migratory birds."*

Response: The expected impacts of going from 3,600 to 3,100 cfs for the period of November 1 through the end of February (February only after receiving separate approval from NOAA-Fisheries due to concerns about potential impacts to shortnose sturgeon) while in drought Level 4 conditions are temporary and eventually normal flows would be expected to return. This action could delay a later major impact if it became necessary to go to outflow = inflow, which could be as low as 300 cfs.

12-TJ-21-EV11, 12-TJ-21-EN04

Comment: *"The Draft EA is especially troubling with the very real potential for the Savannah Harbor to be deepened to 48 feet, which will result in further losses of important tidal freshwater wetlands. The potential effects on the estuary and the Savannah NWR from proposed harbor expansion are uncertain. Therefore, any additional stressors, such as reduced flows, on the estuary could easily exacerbate or multiply the negative effects of the proposed harbor expansion. This potential is not considered within this Draft EA. Therefore, the Service disagrees with ACOE's contention that 439 acres of impact may be an overestimate; this may in fact underestimate the actual impact. Also, we are concerned with the use of the Model-to-Marsh (M2M) decision support system used in the analysis. In the Draft EIS for the Savannah Harbor Expansion, the USGS developed the M2M linkage to provide input into the Marsh Succession Model used to identify impacts to wetlands. The M2M linkage used salinity values in the tidal creeks and distributed those values across the marsh surface to estimate salinity values in the*

marsh root zone. However, the Marsh Succession Model produced erroneous results that were traced to flaws in the way the M2M linkage extrapolated salinity values and distributed them across the marsh. As a result, the Federal Cooperating Agencies abandoned the use of the Marsh Succession Models. Thus, it is uncertain why the results of the M2M have been used in this Draft EA when they were rejected for the Savannah Harbor Expansion Draft EIS - - the veracity of the M2M is no different in this case and should not be the basis for decisions here.. Although the Draft EA considered the M2M an appropriate tool to analyze potential impacts, the use of any model or part of a model that was subsequently rejected by other Federal agencies in a seemingly similar application of wetland impacts is troubling and surrounds any results with great suspicion."

Response: The difficulties with the M2M resulted from its use in SHEP to evaluate changes in the flow distribution between the three major rivers in the Savannah River estuary – Front, Middle, and Back Rivers. Since the M2M was based on existing flow relationships between those rivers, the tool did not accurately predict salinity levels across the marsh when evaluating new flow distributions. The District believes that the M2M is a reasonable tool to identify potential wetland impacts in the estuary from a reduction in flow down the Savannah River. The distribution of flows between the three rivers would not be changed by the action proposed in this EA, so the M2M should provide reasonable information from which to evaluate potential wetland effects.

12-TJ-21-EV12

Comment: *A diversity of native aquatic species are found in Savannah River oxbows, including numerous game fishes, the State-threatened Savannah lilliput, and State-threatened Altamaha arcmussel. The Draft EA states "preliminary observations indicate that much [oxbow] habitat is lost or degraded due to loss of connectivity with the main river at flows below 4,000 cfs at Augusta. Even when some water is present, low dissolved oxygen levels are probable during the warmer seasons because of lack of river flows and stagnant conditions in those specific sites." The Service expects that the flow reduction is less likely to exacerbate low dissolved oxygen problems in oxbows during the winter timeframe of the proposed flow reduction. However, the Draft EA indicates that "monitoring would be conducted of those oxbows to identify effects of the proposed flow reduction (page 73 of Draft EA)." While the Service agrees that monitoring of oxbow habitats should be a priority during periods of reduced flows, the Draft EA does not specify the responsible parties for funding and conducting the monitoring, nor what methodology or objectives would be employed. Oxbow habitat monitoring is not included as a monitoring objective in the Draft EA; therefore, we recommend that oxbow habitat and water quality monitoring be included in Table 13 on page 52. Mussel distribution data suggests that mussels occur in the vicinity of oxbows at elevations that could potentially be dry at discharge < 4,000 cfs. We suggest that relationships be developed among mussel distributions, densities, and discharge to be used as a component of an evaluation of flow management alternatives."*

Response: Revised by deleting the sentence "The Corps understands that some monitoring would be conducted of those oxbows to identify effects of the proposed flow reduction" since the District could not identify an organization that would commit to perform that work during a drought. With oxbow connectivity being lost at 4000 cfs, the proposed flow reduction of going

from 3600 cfs to 3100 cfs would make little difference in potential impacts to mussels during the winter months.

12-TJ-21-EV13

Comment: *Past iterations of proposed flow reductions suggested similar coordination between ACOE and the City of Augusta to ensure base flows for Augusta Shoals. The Draft EA clarifies that "the City is not required to implement the provisions of the yet-to-be finalized Settlement Agreement, [but the city] will use its best efforts to meet the terms for flows as set forth therein, including the higher flows during the month of February as set forth in the respective tiers." The Service emphasizes that this level of coordination has not resulted in actual implementation, and it appears that the City has disregarded this agreement in past and the recent period of low flows. We recommend that ACOE provide some means to ensure that aquatic base flows in the shoals are achieved, and that ACOE be responsible for a shoal inflow monitoring component during all drought levels (sensu the Agreed Aquatic Base Flow table)."*

Response: USACE has no regulatory authority over the quantity of downstream withdrawals or diversions which may have an negative impact on water quality or water supply. The State Water Resource agencies have regulatory authority to enforce water quality standards to ensure adequate water quality for downstream habitat. The City of Augusta has installed a backup set of diesel powered pumps to use in place of the hydromechanical pumping system that they indicate will give them more operational flexibility during severe drought conditions.

12-TJ-21-EV14

Comment: *Over 60% of the tidal freshwater wetlands originally within the Savannah River estuary are lost from the regular incursion of the salinity gradient upriver due to conditions caused by harbor expansions and reduction of flows upriver. The majority of the remaining tidal freshwater wetlands are located on the Savannah NWR. The Draft EA states that only "439 acres of freshwater marsh would undergo temporary adverse effects due to higher salinity as a result of Alternative 1." This statement is misleading since the loss or degradation of any wetland acreage is significant given so much of the tidal freshwater wetlands within the estuary is already permanently lost. Also, the effects of saline water on freshwater marsh plant communities are not easily or quickly reversed within the impoundments. Several years of saturation with fresh water (<0.5 ppt) is required to restore the integrity of the freshwater community within the managed impoundments. Reduced flows will further weaken an already tenuous hold on the managed wetlands within the Savannah NWR that provides sanctuary for an average of 23% of South Carolina's wintering waterfowl as well as a number of other migratory birds. Thus, critical monitoring objectives at the Savannah NWR are the target Clyo discharge of > 4,500 cfs and salinity profiles in the vicinity of the Savannah NWR. We recommend that these monitoring objectives be included in the monitoring strategy during all drought levels."*

Response: Table 13 states that SC DHEC monitors flow at Clyo.

12-TJ-21-EV15

Comment: *It is unclear as to how the potential effects of the proposed alternative to shortnose sturgeon (Acipenser brevirostrum) will be monitored. The Draft EA states that the flow reduction*

would be maintained until the end of February or until such time that a monitoring parameter, such as sturgeon migration, is outside of acceptable levels. In past iterations of ACOE's Draft EA's related to the DCP, the Service highlighted concerns and problems associated with the ACOE's proposed sturgeon-related management triggers. The Draft EA makes no mention regarding how the shortnose sturgeon migration would be monitored. We recommend that the methodology to monitor effects to shortnose sturgeon be described in sufficient detail in ACOE's Draft EA, and such methodology include at a minimum, appropriate measures of sturgeon occurrence, migration, spawning, and recruitment."

Response: Added "(February only after receiving separate approval from NOAA-Fisheries due to concerns about potential impacts to shortnose sturgeon)" in several locations. Therefore, at NMFS discretion, the February Level 4 flow reduction can be reduced or eliminated.

12-TJ-21-EV16

Comment: *"We concur with your determination that the proposed action is not likely to adversely affect the wood stork or manatee. However, although we have concerns about the adequacy and appropriateness of your determination regarding the endangered shortnose sturgeon, NMFS is the designated lead agency and will need to address your determination regarding potential impacts to shortnose sturgeon. As such, their agency needs to be included in Table 19 on page 93 of the Draft EA in reference to the ESA."*

Response: NMFS has been added to the ESA paragraph in Table 19.

12-TJ-21-EV17

Comment: *"Finally, the Service reminds ACOE that when a water body is proposed to be controlled or modified "for any purpose whatever" by a Federal agency, the action agency is required first to consult with wildlife agencies (Federal and State) "with a view to the conservation of fish and wildlife resources." Doing so enables ACOE and other agencies to develop an informed alternative that minimizes impacts to fish, wildlife, and ecosystems while meeting project objectives. To ensure sustainability for these resources, the Service will continue to work cooperatively with ACOE. In particular, the Service and NMFS need to be an integral member of ACOE's team when formulating and evaluating operational alternatives."*

Response: Consultation with the appropriate Federal and State wildlife agencies will continue.

Public Comment- Joe Brenner

13-LO-01-EV01

Comment: ***"****I strongly object to the Corps proposal of targeted flows at Drought Level 4, as opposed to the existing "Flow in equal flow out" plan. This is based on the following:*

1. The focus of any changes to the Drought Contingency Plan should be on mitigation of drought impacts. Modifications should not be approached piecemeal, but as part of a comprehensive review of the entire plan based on lessons learned. The Corps, in the person of General Schroedel, committed to amend the existing Drought Contingency Plan, based on lessons learned during the Drought of Record. As an example, during Level 3 conditions, flows were in fact lowered to 3100/3600CFS during winter/summer with no significant adverse consequences. The Corps also did limited adaptive management by significantly curtailing flows when downstream rainfall and flows permitted. The Corps has failed to follow through on this commitment."

Response: The emergency funds obtained to conduct this study do not allow examination of the entire Drought Contingency Plan, but only actions during extreme Level 4 drought conditions. The Corps does intend to conduct an "After Action Report" to identify the extent to which the Drought Contingency Plan would have fulfilled the needs during the recent drought of record if it were followed without any deviations or additional actions from SEPA.

Comment: ***"****2. No change of this magnitude and with such potential for adverse consequences should be done through the EA process, which has historically been used for temporary modifications to address current conditions. There has never been a comprehensive study of the impacts of operation on the Savannah Lakes below Level 4 conditions. There is the potential for significant adverse impacts to the fishery, water quality, water supply, etc. Any such proposal must be assessed through an Environmental Impact Study, with substantial stakeholder involvement."*

Response: One of the conclusions of the Corps' Environmental Assessment is that an Environmental Impact Statement is not warranted to evaluate the proposed action.

Public Comment- SC-SHPO

14-LO-01-EV01

Comment: "*The Environmental Assessment notes that no archaeological survey of the shoreline has been conducted, yet significant known archaeological resources are present and are being affected by the operation of the reservoir. The SHPO recommends that an intensive cultural resources survey be conducted on the shore lines of J. Strom Thurmond Reservoir in order to identify additional historic properties that may be affected by the proposed drought discharge reduction. Our office recommends this survey because there are known archaeological sites within the Area of Potential Effect (APE). The purpose of the recommended survey is to identify cultural and historic sites, particularly archaeological sites, and evaluate their eligibility for listing in the National Register of Historic Places (NRHP). The results of this survey will be used to determine how changes in pool elevations are affecting historic properties."*

Response: The District concurs. The District is reinitiating consultation with the Georgia and South Carolina State Historic Preservation Offices and interested Native American Tribes. The District has prepared a Programmatic Agreement outlining procedures for identifying, evaluating, and mitigating affects to significant historic properties.

Public Comment- NOAA-NMFS

15-LO-02-EV01

Comment: "*A reduction in flow pattern is likely to affect both diadromous fish spawning and recruitment potential in the Savannah River. In particular the federally-protected shortnose sturgeon are known to utilize the gravel bar just below New Savannah Bluff Lock and Dam (NSBLD) as spawning habitat; all habitat upstream of this location is not accessible due to severely limited fish passage. NMFS believes that the reduction in flow during the months of February and March will negatively impact this extremely limited spawning habitat by making submerged areas emergent. Further because water velocity and flow regime influence sturgeon spawning by stimulating adult fish to move up to spawning grounds, NMFS is concerned about modification of flow patterns prior to shortnose sturgeon actual arrival at the gravel bars. The reduced access to spawning sites coupled with the potential of reduced or failed recruitment is a concern to NMFS as effects as chronic impacts to both status of the population and the progeny of future generations that will be realized indefinitely.*

The draft EA fails to provide information to support the conclusion that shortnose sturgeon would not be adversely affected by the continued reduction of flow. NMFS would require an analysis of how reduced flow impacts the known spawning area below NSBLD, and consequences of the reduction in areal availability of spawning substrate. Specifically the draft EA fails to incorporate results from two recent investigations funded by the COE that investigated impacts of flow on the gravel bars downstream of NSBLD. In particular those studies found:

1. *A flow of 6870 cfs is necessary to keep Gravel Bar #2 submerged (Grabowski and Isely 2007).*
2. *A flow of 6200 cfs is necessary to keep 0.3 meters of water over the top of Gravel Bar #1 (Jackson and Long 2011).*
3. *Gravel bars are submerged when flow is about 4 ft on Augusta gage which equated to about 5,000-6,000 cfs (D. Allen SCDNR Pers. Com. As cited in Meyer et al. 2003).*

Therefore, because the time period requested for the action overlaps with shortnose sturgeon spawning, we cannot concur with you determination in the draft EA that the action would not adversely affect a threatened or endangered species. A formal Section 7 consultation would be required to ensure the proposed action did not jeopardize the continued existence of shortnose sturgeon. However, NMFS could agree with your determination that the action does not adversely affect shortnose sturgeon if the period was modified and flows were returned to 3,600 cfs by February 1."

Response: The Corps has revised the EA to state that the flow reduction would extend into February only after receiving separate approval from NOAA Fisheries that the action would not unacceptably impact shortnose sturgeon.

15-LO-02-EV02

Comment: "*The effects of the drought flow reductions on Essential Fish Habitat (EFH) in the lower Savannah River estuary remain unclear. Effects of the proposed flow reductions on EFH*

would be reduced in the balance between tidal freshwater marsh and oligohaline marsh. The physiography of the Savannah River Estuary has been extensively modified during the past 150 years, and those modifications have altered the physical factors that result in the relative distribution of these marsh habitats; sea level rise and components of the Savannah Harbor Expansion Project, assuming it is constructed, would further alter these physical factors and, consequently, distribution of these marsh types. While we agree that the effects of the proposed flow reductions from JST Dam would likely have less of effect on marsh habitat than these other causes, particularly if the flow reductions did not occur past January 31, we request the COE further substantiate the claim that the habitat shifts would not impair the nursery function of the marsh during the spring when larval shrimp, crabs and flounder use these areas. Our letter from June 24, 2009, is enclosed and provides recommendations for examining impacts to riverine habitat from the proposed flow reductions from JST Dam should the COE continue to propose reducing flows beyond January 31."

Response: The expected impacts of going to 3,100 cfs during the winter months (November-February) would be temporary and normal river flows would be expected to return. The proposed action would delay a later major impact if it became necessary to go to outflow = inflow at Thurmond Dam, which could be as low as 300 cfs.

Public Comment- Sam Booher

20-LO-5-EV01

Comment: "*Currently the City of Augusta by way of the Augusta Canal removes water at approximately 3,600 cubic feet per-second (cfs) from the Savannah River. Even with the local area in drought conditions water is currently flowing over the canal's ray's creek spillway into Ray's Creek. Why because there is truly no accurate gage measuring nor any Corps management of the Augusta Canal flow. I am aware of a USGS gage on the canal but its data is not accurate enough nor is there any management utilizing even this information. The canal water is removed above the Augusta Shoals and returned to the Savannah River below the shoals minus the water removed for drinking by Richmond County."*

Response: The Corps believes the USGS gage in the Augusta Canal accurately measures flow down the Canal.

20-LO-5-EN01

Comment: "*When due to drought conditions Clark Hill lake level drops to 312 ft. the Corps currently considers the lake to be at Drought Level four. They then limited the water release to 3,600 cfs, this results in the only water going through the Augusta shoals is the small amount coming in from Stevens Creek and several other small creeks from the Georgia and South Carolina banks from Clark Hill Dam to the Old Lock and Dam. Why because the Augusta Canal is taking all of the remaining water. The Corps needs to take Ray's Creek spillway lost flow from the shoals as well as a needed drop of 500 cfs into consideration as part of their new Drought plan is adopted."*

Response: USACE has no regulatory authority over the quantity of downstream withdrawals or diversions, some of which could have an negative impact on water quality or water supply. The State Water Resource agencies have regulatory authority to enforce water quality standards to ensure adequate water quality. The City of Augusta has installed a backup set of diesel powered pumps to use in place of the hydro-mechanical pumping system that they indicate will give them more operational flexibility during severe drought conditions.

20-LO-5-EN02

Comment: "*If the proposed drop to 3,100 cfs is put in place and there is no communication and written agreement worked out with the Mayor/ Richmond County Commissioners and their lawyers the shoals during this low flow period will be dry. A written agreement needs to be put in the New Drought Plan that insures an equal 500 cubic feet per second drop in withdrawal from the Savannah River by the City Water Department at the Canal Head gate. This 500 cfs drop must be verified by the Army Corps prior to Clark Hill Dam going to this new low level of discharge."*

Response: USACE has encouraged Augusta to meet their proposed diversion agreement with USFWS. However, USACE has no regulatory authority over the quantity of downstream withdrawals or diversions. The State Water Resource agencies have regulatory authority to enforce water quality standards to ensure adequate water quality for downstream habitat.

USACE encourages GA DNR-EPD to exercise its regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in the Augusta Shoals.

20-LO-5-EN03

Comment: "*The New Drought Plan needs to also state that, in reverse order, only after the Corps increases the 3,100 back to 3,600 cfs and informs the City Manager, should the City Water Department be permitted to again increase its withdrawal from the Savannah River."*

Response: USACE has encouraged GA DNR-EPD to exercise its regulatory authorities over the magnitude of the diversion at the Augusta Canal to ensure adequate minimum flow in the Augusta Shoals.

20-LO-5-EN04

Comment: "*The Savannah Corps needs to also insure an accurate gage that records Canal water withdrawal from the Savannah River is installed. Currently the Ray's Creek spillway is the only accurate way to know when excess water is flowing through the canal. During our current drought, the City Water Department is currently withdrawing so much water that the Ray's Creek has at least 200 cfs going over the spillway today."*

Response: There currently exists a USGS flow gage in the Augusta Canal and in the Stevens Creek Dam tailrace which can be used to reasonably determine the magnitude of the diversion into the Augusta Canal and flow into the Shoals.

Public Comment- Anderson Area Chamber of Commerce

23-LO-01-EV01

Comment: "*While we agree with reduction of outflows of the Lake Thurmond Dam from 3600 to 3100 cfs, we question why this action was only considered for drought Level 4. We were under the impression that the Corps was considering the reduction of outflow from Thurmond in Drought Levels 2 and 3. We understand that reductions at the earlier drought phases may cause the initiation of an Environmental Impact Study and of course, more funding will be required.*

The Anderson Area Chamber of Commerce encourages the Corps to look into this matter further even if it requires further study. Please clarify for us why we did not pursue this question any further than Drought Level 4."

Response: This particular proposal addresses concerns expressed by the public in the past, as well as a suggestion by the US General Accounting Office to study a strategy to address the potential drought situation in which lake levels fall below the bottom of the conservation pool. The emergency funds obtained to conduct this study do not allow examination of the entire Drought Contingency Plan, but only actions during extreme Level 4 drought conditions. The Corps intends to examine the entire Drought Contingency Plan during the next phase of the Savannah River Basin Comprehensive Study, if that study is resumed.

Public Comment- GA-DNR, CRD

24-LO-01-EV01

Comment: "*Adherence to the Savannah River Basin Drought Contingency Plan (SRBDCP) has prevented the Savannah River reservoirs from reaching Drought Level 4 Status through two droughts of record in the last 10 years. The proposed modification better defines the release schedule while in Drought Level 4 Status and would delay the onset of lower flows as currently prescribed in Level 4 of the SRBDCP. The Savannah Lilliput (Toxolasma pullus) is recognized as threatened by Georgia with a sub-national rarity ranking of S2 and should be included in Table 6, page 35 and in monitoring assessments."*

Response: The Corp has added the Savannah Lilliput to its consideration of threatened species in the Final EA.

Public Comment- Michael Massey

28-TJ-03-EV01

Comment: *"I cannot understand how a permanent change of this significance to all SRB stakeholders can be implemented as a result of an Environmental Assessment. This magnitude of change should only be implemented via results of an Environmental Impact Statement (EIS) and/or other comprehensive study of the complete basin. Significant alternative recommendations should also be included for review."*

Response: The Corps believes that the impacts identified from the proposed action are minimal and do not warrant preparation of an EIS.

28-TJ-03-EN01

Comment: *"It is certainly much wiser to begin managing water levels at drought levels 1, 2 and 3 as soon as a drought is predicted and/or has been defined. The State of South Carolina DNR Drought Response Act states that "During a drought declaration, the use of water from a managed watershed impoundment shall not be restricted* ***as long as minimum streamflow or flow equal to the 7Q10 is maintained****, whichever is less." It also states that instream flows less than the 7Q10 rate may be insufficient to adequately assimilate waste loads and can result in water-quality standards violations. It has not been identified in the EA, or any other studies I am aware of, exactly what the acceptable 7Q10 rate is in any of the lakes at any low lake water level, regardless what drought level we are in. Many stakeholders have been asking for a study to determine flow rates. There will certainly be flows present and much less water when the lakes drop significantly. It is very difficult to understand how a "****Finding of No Significant Impact*** *(FONSI)" can be an accurate finding without that data."*

Response: The States have not developed a 7Q10 for the Hartwell and Russell reservoirs. GA DNR-EPD bases downstream water quality permits on a 3,600 cfs release from Thurmond Dam, plus local inflow at 7Q10 rates to the downstream point of interest for the permit. During the proposed winter flow reductions, enough unregulated local inflow would need to occur downstream of Thurmond to meet identified needs for water quality and quantity for permitted levels. Part of the adaptive management role of the State agencies is to ensure those needs are met. If the States believe they are not being met, they would request the District return to discharges up to 3,600 cfs during the winter flow reduction window.

28-TJ-03-EV02

Comment: *"The high probability of impaired water quality in the lakes due to low water levels must be part of the consideration for management of level 4 impacts (and of course, any level). There are thousands of water users of these lakes that may be subject to illness due to unhealthy drinking water. The main issue being the the inability to adequately assimilate waste loads. It just makes sense to avoid reaching that situation by slowing water discharges immediately upon recognizing a drought condition exists. It is my belief that a completely revised process to manage lake levels is necessary."*

Response: If implemented, this proposal would slow the drop of the lake elevations when in the severest of droughts, Level 4, if compared to the No Action Alternative. This EA was not intended to evaluate potential improvements to the entire Drought Contingency Plan.

APPENDIX O

DRAFT PROGRAMMATIC AGREEMENT

PROGRAMMATIC AGREEMENT
AMONG THE US ARMY CORPS OF ENGINEERS, SAVANNAH DISTRICT,
THE GEORGIA STATE HISTORIC PRESERVATION OFFICER, AND
THE SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER

WHEREAS, the US Army Corps of Engineers, Savannah District (Savannah District), operates and maintains Hartwell Lake and J. Strom Thurmond Lake (the lakes), and

WHEREAS, the lakes were constructed prior to the passage of the National Historic Preservation Act (P.L. 89-665, as amended) and the now inundated lands were not surveyed for historic properties prior to inundation; and,

WHEREAS, since their creation, the lake elevations have been managed using criteria developed to address the needs of hydropower, water supply, environmental resources, and recreation; and,

WHEREAS, the Savannah District proposes to alter the criteria for managing lake elevations when in a severe drought (Level 4) and the effects of the proposed action upon historic properties have not been completely documented; and,

WHEREAS, the lakes lie within the States of South Carolina and Georgia, and

WHEREAS, the Savannah District recognizes that extending the periods of wetting and drying may have an effect upon historic properties included in or eligible for inclusion in the National Register of Historic Places and has consulted with the Advisory Council on Historic Preservation (Council), the Georgia State Historic Preservation Officer (Georgia SHPO), the South Carolina State Historic Preservation Officer (South Carolina SHPO), and Native American Tribes pursuant to regulation 36 CFR, Part 800 implementing Section 106 of the National Historic Preservation Act (16 U.S.C. 470h-2(f), and

NOW THEREFORE, the Savannah District, the Consulting Parties composed of the Georgia SHPO and the South Carolina SHPO agree that the project shall be administered in accordance with the following stipulations to satisfy Savannah District's Section 106 responsibilities for all individual aspects of the project.

Stipulations

The Savannah District, subject to receiving funds appropriated by the Congress of the United States, shall reinitiate consultation under Section 106 with the Georgia SHPO, South Carolina SHPO, and Native American Tribes and shall ensure that the following measures are carried out:

1. Savannah District and the consulting parties shall identify the need for and scope of, archeological surveys of inundated areas that are affected by changes in Level 4 drought operations. The surveys shall be conducted in a manner consistent with the Secretary of Interior's Standards and Guidelines for Identification (48 F.R. 44720-23) and any standards and guidelines developed by the Georgia SHPO and the South Carolina SHPO. The surveys shall be conducted in consultation with the Georgia SHPO and the South Carolina SHPO, and reports of the survey shall be submitted to the Georgia SHPO and the South Carolina SHPO for review and comment.

2. The Savannah District shall evaluate properties identified through the surveys in accordance with 36 CFR, Part 800.4. If the survey results in the identification of properties that are eligible for, or included in, the National Register of Historic Places, Savannah District shall determine the effect of the proposed project upon those resources in accordance with 36 CFR, Part 800.5.

3. The Savannah District shall identify and evaluate alternatives to avoid and/or mitigate adverse effects to properties determined eligible for inclusion, or included in, the National Register of Historic Places in accordance with 36 CFR, Part 800.6.

4. The Savannah District shall insure that data recovery plans are developed in consultation with the Georgia SHPO or South Carolina SHPO (as appropriate) for the recovery of archaeological data from properties determined eligible for inclusion in the National Register of Historic Places. The plans shall be consistent with the Secretary of the Interior's Standards and Guidelines for Archeological Documentation (48 F.R. 44734-37) and take into account the Council's publication, *Treatment of Archeological Properties* (Advisory Council on Historic Preservation 1980), and any standards and guidelines set forth by the Georgia SHPO and South Carolina SHPO. The plans shall specify, at a minimum:

a. the property, properties, or portions of properties where data recovery is to be carried out;

b. any property, properties, or portions of properties that will be destroyed without data recovery;

c. the research questions to be addressed through the data recovery, with an explanation of their relevance and importance;

d. the methods to be used, with an explanation of their relevance to the research questions;

e. the methods to be used in analysis, data management, and dissemination of data, including a schedule;

f. the proposed disposition of recovered materials and records;

g. proposed methods for involving the interested public in the data recovery;

h. proposed methods for disseminating results of the work to the interested public;

i. proposed methods by which local historic sites and historic preservation agencies and individuals will be kept informed of the work and afforded the opportunity to participate; and,

j. a proposed schedule for the submission of progress reports to the Savannah District, the Georgia SHPO, and the South Carolina SHPO.

5. The data recovery plans shall be submitted by the Savannah District to the Georgia SHPO and/or South Carolina SHPO (as appropriate) for 45 days review. Unless the Georgia SHPO or South Carolina SHPO objects within 45 days after receipt of a data recovery plan, the Savannah District shall ensure that it is implemented.

6. The Savannah District shall ensure that all archeological survey, testing, and data recovery work carried out pursuant to this Programmatic Agreement is carried out by or under the direct supervision of a person or persons meeting at a minimum the standards for archeologist set forth in the Secretary of the Interior's Standards and Guidelines for Archeological Documentation (48 F.R. 44716-42).

7. The Savannah District shall ensure that all materials and records resulting from survey, testing, and data recovery are curated in accordance with 36 CFR, Part 79.

8. The Savannah District shall ensure that all final archeological reports resulting from actions pursuant to this agreement will be provided to the Georgia SHPO and the South Carolina SHPO. The Savannah District shall ensure that all such reports are responsive to the contemporary professional standards, and to the Department of Interior's Format Standards for Final Reports of Data Recovery Programs (42 F.R. 5377-79).

9. Any party to this Programmatic Agreement may request that it be amended, whereupon the parties will consult in accordance with 36 CFR, Part 800.6(c)(7) to consider amendment.

10. The Georgia SHPO and the South Carolina SHPO may monitor activities carried out pursuant to this Programmatic Agreement, and the Council will review such activities if so requested. The Savannah District will cooperate with the Georgia SHPO and the South Carolina SHPO in carrying out their monitoring and review responsibilities.

11. The parties to this agreement shall consult to review implementation of the terms of this agreement and determine whether revisions are needed. If revisions are needed, the parties to this agreement will consult in accordance with 36 CFR, Part 800 to make such revisions.

12. Any party to this agreement may terminate it by providing 30 days notice to the other parties, provided that the parties will consult during the period prior to termination to seek agreement on amendments or other actions that would avoid termination. In the event of termination, the Savannah District will comply with 36 CFR, Parts 800.4 through 800.6 with regard to individual undertakings covered by this Programmatic Agreement.

13. Should the Georgia SHPO or South Carolina SHPO object within 45 days to any actions proposed pursuant to the agreement, the Savannah District shall consult with the objecting party to resolve the objection. If the Savannah District determines that the objection cannot be resolved, the Savannah District shall request further comments of the Council pursuant to 36 CFR, Part 800.7. Any Council comment provided in response to such a request will be taken into account by the Savannah District in accordance with 36 CFR, Part 800.7 with reference only to the subject of the dispute; the Savannah District's responsibility to carry out all actions under this agreement that are not the subjects of the dispute will remain unchanged.

14. If any unanticipated archaeological sites and/or human skeletal remains are discovered during archaeological surveys, Savannah District shall secure the area in the immediate vicinity of the discovery and shall notify the Georgia SHPO or the South Carolina SHPO, as applicable, and interested Native American Tribes, by telephone, followed by written communication, as soon as practicable. Savannah District, the Georgia SHPO or South Carolina SHPO, as applicable, and Native American Tribes shall assess the situation and recommend a course of action within two business days after such notification.

15. At any time during implementation to the measures stipulated in this agreement, should an objection to any such measure be raised by a Native American Tribe or another member of the public, the Savannah District shall take the objection into account and consult as needed with the objecting party, the Georgia SHPO, and the South Carolina SHPO to resolve the objection.

16. In the event the Savannah District does not carry out the terms of the Programmatic Agreement, the Savannah District will comply with 36 CFR, Parts 800.4 through 800.6 with regard to individual undertakings covered by this Programmatic Agreement.

17. Execution and implementation of this Programmatic Agreement evidences that the Savannah District has satisfied its Section 106 responsibilities for all individual undertakings of the program.

18. Nothing herein shall constitute, or be deemed to constitute, an obligation of future appropriations by the United States.

US ARMY CORPS OF ENGINEERS, SAVANNAH DISTRICT:

_____ DATE:_____

Jeffrey M. Hall
Colonel, US Army
Commanding

GEORGIA STATE HISTORIC PRESERVATION OFFICER:

_____ DATE:_____

David Crass, Ph.D., Division Director and Deputy State Historic Preservation Officer

SOUTH CAROLINA STATE HISTORIC PRESERVATION OFFICER:

_____ DATE:_____

Lewis C. Sumner, Division Director and State Historic Preservation Officer

Concurring Party

To be determined: Interested Native American Tribes and other parties.