FINAL
ENVIRONMENTAL ASSESSMENT
AND
FINDING OF NO SIGNIFICANT IMPACT

TEMPORARY DEVIATION
DROUGHT CONTINGENCY PLAN
SAVANNAH RIVER BASIN

US ARMY CORPS OF ENGINEERS
SAVANNAH DISTRICT

November 2008

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ACRONYMS

CFR ---------- Code of Federal Regulations
cfs ---------- cubic feet per second
DHEC ---------- Department of Health and Environmental Control
DNR ---------- Department of Natural Resources
DO ---------- Dissolved Oxygen
EA---------- Environmental Assessment
EFM ---------- Ecosystems Function Model
EPA ---------- Environmental Protection Agency
EPD ---------- Environmental Protection Division
HEC---------- US Army Corps of Engineers Hydrologic Engineering Center
JST ---------- J. Strom Thurmond
msl ---------- mean sea level
NAA ---------- No Action Alternative
NEPA ---------- National Environmental Policy Act of 1969
NOAA ---------- National Oceanic and Atmospheric Administration
NSBL&D-------- New Savannah Bluff Lock and Dam
NWR---------- National Wildlife Refuge
PDT ---------- Project Delivery Team
RBR---------- Richard B. Russell
SEPA ---------- Southeastern Power Administration
SHPO ---------- State Historic Preservation Officer
SRBDCP -------- Savannah River Basin Drought Contingency Plan
USFWS---------- United States Fish and Wildlife Service
USGS ---------- United States Geologic Survey
WY---------- Water Year

FINDING OF NO SIGNIFICANT IMPACT

Name of Action: Drought Contingency Plan Temporary Deviation for the Savannah River Basin

1. Description of the Proposed Action

The proposed action consists of retaining the major components of the 1989 Savannah River Basin Drought Contingency Plan (SRBDCP) and temporarily adjust one feature. The minimum daily average release at J. Strom Thurmond Dam would be adjusted from 3,600 to 3,100 cubic feet per second (cfs) in drought Level 3 from November 1, 2008 through February 28, 2009. This change would preserve water in the US Army Corps of Engineers reservoirs and delay the time at which those reservoirs would reach the bottom of their conservation storage. The Corps would restore the water flows up to the 3,600 cfs per day daily average if requested by either the State of Georgia or South Carolina.

2. Other Alternatives Considered

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 Savannah River Basin Drought Contingency Plan (SRBDCP) as updated in 2006)

b. Alternative 1 (Selected Alternative): Retain the major components of the 1989 SRBDCP and temporarily adjust one feature. The minimum daily average release at Thurmond Dam would be adjusted from 3,600 to 3,100 cfs for the period November 1, 2008 through February 28, 2009 while in drought Level 3. The flow reduction would be implemented in a 2-step process, with flows dropping to 3,300 cfs for one week, followed by the remaining reduction to 3,100 cfs.

c. Alternatives Considered but Eliminated from Detailed Consideration: A preliminary alternative that was initially considered was similar to Alternative 1, with a daily average flow reduction to 3,300 cfs for the cooler months (October 1 to February 28). Under the recorded 2007 hydrology (with a 10% reduction in inflow), a release of 3,300 cfs from Thurmond Dam was found to not sufficiently stabilize the reservoir system and improve the reservoir refill probabilities.

3. Coordination

Savannah District coordinated this action with Federal, State and local agencies and issued a Notice of Availability to solicit comments from the public on the Draft Environmental Assessment.

4. Conclusions

Based on a review of the information contained in this Environmental Assessment (EA), I have determined that the preferred alternative is the best course of action. I have also determined that the Drought Contingency Plan Temporary Deviation for the Savannah River Basin is not a major Federal action within the meaning of Section 102(2)(c) of the National Environmental Policy Act of 1969. Accordingly, the preparation of an Environmental Impact Statement is not required. My determination was made considering the following factors discussed in the EA to which this document is attached:

a. The proposed action would not adversely affect any threatened or endangered species (may affect, but not likely to adversely affect shortnose sturgeon, manatee, and wood stork).

b. The proposed action would not adversely impact cultural resources.

c. The proposed action would not adversely impact air quality.

d. The proposed action complies with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations."

e. The proposed action would not cause any significant long term adverse impacts to wetlands.

f. No unacceptable adverse cumulative or secondary impacts would result from the implementation of the proposed action.

NOAA-Fisheries Service stated that they agree with our determination that the proposed flow reduction is not likely to adversely affect shortnose sturgeon if flows are restored to 3,600 cfs beginning 1 February. The Corps intends to continue coordination with NOAA Fisheries and would not extend the flow reduction into February unless we obtain approval from NOAA Fisheries for that action.

5. Findings

The proposed action to temporarily deviate from the Drought Contingency Plan for the Savannah River Basin would result in no significant environmental impacts and is the alternative that represents sound natural resource management practices and environmental standards.

24 Nov 08
Date

Edward J. Kertis
Colonel, US Army
Commanding

FINAL ENVIRONMENTAL ASSESSMENT

1.0 PURPOSE AND NEED FOR THE PROPOSED ACTION

1.1. INTRODUCTION

1.1.1. History

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. The current drought has become the new drought-of-record for the basin. Hartwell Lake is experiencing its lowest pool elevations since it was initially filled in 1962.

The Corps manages the 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 occurs, 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 an 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.

The severity of the drought created conditions which stressed the traditional management concepts which Savannah District followed to regulate the individual Corps impoundments and the integrated water management of the three lakes. Concerns and conflicts over competing water issues intensified as drought conditions became more severe and lake levels continued to fall. During 1986, the Savannah District developed a Short-Range Drought Water Management Strategy to address the worsening water shortage conditions in the Savannah River Basin. That document served as a guide for using the remaining storage in the Corps operated Savannah River impoundments for the duration of the drought. The short-range strategy also served as a prelude to the development of a long-term drought strategy, the Savannah River Basin Drought Contingency Plan (SRBDCP) of March 1989. That plan was modified in 2006 by the revision of actions that would occur at the various drought trigger levels. The intent of those modifications was to act earlier in a drought to preserve additional water in the lakes, thereby delaying the time when the conservation pools would be depleted and outflows would reflect only the inflows that the lakes received.

In October 2007, the Federal and State natural resource agencies agreed with Savannah District's request to temporarily reduce the minimum daily average discharge from Thurmond Dam from the 3,800 cfs level specified in the 2006 EA for the DCP Update back to the 3,600 cfs level that was in the original DCP. The Corps' South Atlantic Division office approved that temporary deviation to the DCP that same month. This action was taken in response to the continued drought as a means of preserving water in the lakes and delaying the time when the conservation pools would be depleted. As a result, downstream resources experienced slightly more impacts than would have occurred with strict adherence to the Drought Contingency Plan.

As the ongoing drought in the southeastern U.S. completed 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 October 27, 2008, the system has only 27% of its conservation storage remaining. Hartwell and Thurmond, the two large storage reservoirs, were 17.5 and 15 feet, respectively, below their guide curve. Hartwell has less than 40% of its conservation storage left, and Thurmond has only 10% of its conservation storage remaining.

The spring 2008 recharge season 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 could be exhausted and a consequent transition to Level 4 operations (only releasing inflow) may be on the horizon.

1.1.2. Requirement for Environmental Documentation

An Environmental Assessment (EA) is prepared in conformance with procedures established by the National Environmental Policy Act of 1969 (NEPA) to identify impacts expected to result from implementation of a proposed action. The assessment ensures that the decision-maker is aware of the environmental impacts of the action prior to the decision to proceed with its implementation. This Act requires the consideration of environmental impacts of a "Proposed Action" and its alternatives prior to implementing the action. This EA addresses proposed temporary revisions to the SRB Drought Contingency Plan.

1.1.3. General Objectives

The objectives of the Proposed Action are:

- ⇨ Savannah River Basin – Reduce discharges from the Corps' reservoirs on the Savannah River Basin to maintain the conservation pool as long as possible. This would delay the time when Level 4 conditions would occur. This approach would preserve water supply for as many users as possible and minimize negative impacts to other users adversely affected by this action. Also, implementation of the proposed action would aid in the recovery of the system reservoirs by allowing more storage to be captured during this cool weather season.
- ⇨ Environmental Compliance - comply with all applicable environmental laws, regulations, and policies

1.2. PURPOSE AND NEED

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. The SRBDCP was intended to be a dynamic document which could be changed as new drought periods occur. The purpose for the temporary reduction in flow from Thurmond to 3,100 cfs during the cooler months of November 1, 2008 through February 28, 2009 is to maintain the conservation pools within the Savannah System through at least 2011, and to decrease the recovery time to refill the reservoirs.

1.3. SCOPE

The scope of this EA is limited to assessing the potential environmental and socio-economic effects resulting from implementing the Proposed Action and the No Action Alternative (NAA). After eliminating alternatives that are not considered feasible or effective, the potential environmental impacts associated with the NAA are compared to the Proposed Action.

1.4. STUDY METHODOLOGY

Water managers in Georgia and South Carolina jointly performed a volume analysis of the storage remaining within the conservation pools of the three Corps' managed lakes on the Savannah River. They then considered several different drought hydrologic inflow and outflow scenarios. They performed computer modeling that focused on how long the conservation storage could be preserved within the three-lake system.

The States initially considered several hydrologic and operating scenarios. Among other factors, those scenarios reflected the range of potential inflow amounts that could be expected in the basin. Those alternatives and hydrologic conditions were refined after more data became available from the National Weather Service and lake levels declined over the course of the 2008 summer months. The hydrologic conditions they ultimately chose as inputs for the analysis were based on the 2007 inflows with a 10% reduction.

The goal of the alternatives analysis was to identify an operating approach that would allow the conservation storage within the lakes to decline at a slower rate, while still balancing the authorized project purposes of water supply, water quality, fish and wildlife, and hydropower. If such an alternative could be found, the point at which the conservation storage within the lakes would be depleted would be postponed, delaying Level 4 conditions.

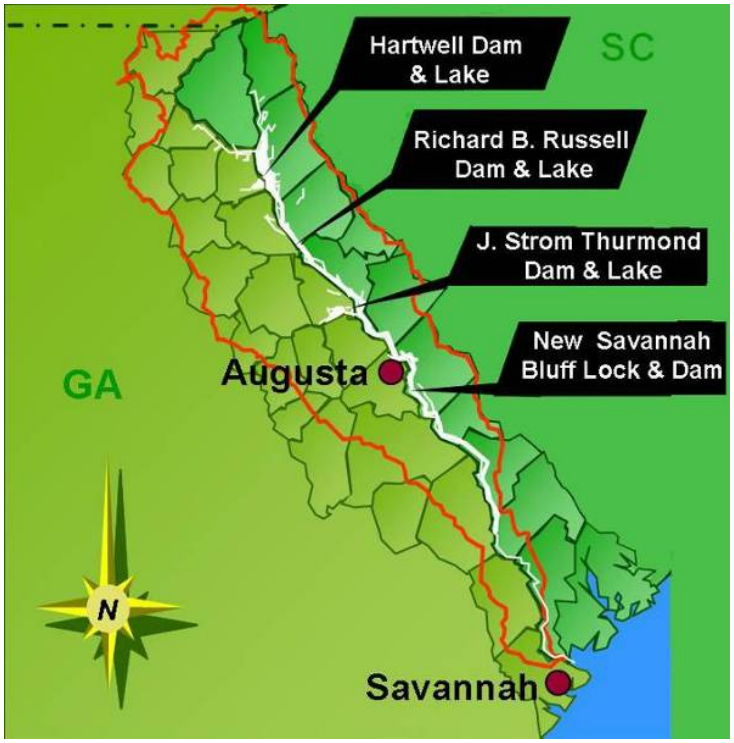
Once the inflow set was chosen, several analyses were performed to identify the impacts of the outflow scenarios on the various project purposes. The proposed alternative consists of a targeted release of 3,100 cfs from Thurmond Dam for the cooler months of October through February when the lakes are in Drought Level 3. This release would be a temporary change to the Savannah River Basin Drought Contingency Plan. The States proposed a flow reduction starting on 1 October, but they did not submit the request to the Corps in time that allowed for evaluation and public comment. The proposal in this Draft EA is to begin the flow reduction on 1 November.

The No Action Alternative follows the water release procedures described in the previously-approved Savannah River Basin Drought Contingency Plan, including previously approved deviations.

2.0 AFFECTED ENVIRONMENT

2.1. DESCRIPTION OF THE SAVANNAH RIVER BASIN

The Savannah River basin has a surface area of approximately 10,577 square miles, of which 5,821 square miles are in Georgia, 4,581 square miles are in South Carolina and 175 square miles are in North Carolina. The basin includes portions of 27 counties in Georgia, 13 counties in South Carolina and four counties in North Carolina. Although the basin is predominantly rural, metropolitan areas are experiencing significant growth and development pressures. The growth is occurring primarily in the areas of Augusta and Savannah, Georgia, although many smaller cities and towns are also growing. The



study area drains portions of three physiographic provinces: the Blue Ridge Mountains, the Piedmont and the Coastal Plain. In its middle and upper reaches the river flow is regulated by several reservoirs, including three large multipurpose Corps projects (Hartwell Lake, Richard B. Russell (RBR) Lake and J. Strom Thurmond (JST) Lake) and two large private power reservoirs (Lakes Keowee and Jocassee). Other structures include the New Savannah Bluff Lock and Dam, the Stevens Creek Dam and the Old Lock and Dam at the Augusta Canal.

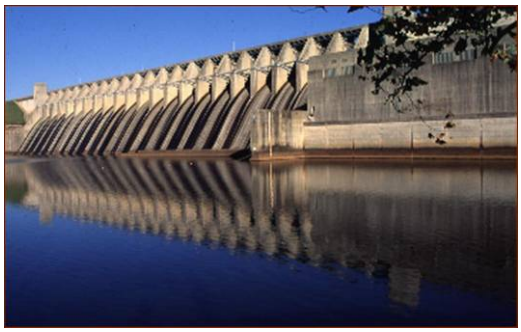

Hartwell Lake and Dam

Water discharge in the Savannah River varies considerably both seasonally and annually, even though it is largely controlled by releases from the Corps' JST Dam located about 20 miles northwest of Augusta, Georgia. Discharge is typically high in winter and early spring and low in summer and fall, but regulation by upstream reservoirs has reduced natural flow variations. At the New Savannah Bluff Lock and Dam located 12 miles downstream of Augusta, average annual discharge is about 10,000 cfs. The range in water year 1998 was about 4,300 to 42,700 cfs. Average discharge at Clyo (Effingham County, Georgia) is 12,040 cfs, with a range for water year 1998 of 6,280 to 52,600 cfs (Cooney et al. 1999). Tidal effects extend upstream to approximately river mile 45 (Reconnaissance Planning Aid Report on the Savannah River Basin Study, US Fish and Wildlife Service, July 1999).


R. B. Russell Lake and Dam

2.2. DESCRIPTION OF CORPS PROJECTS

The Corps maintains and operates three large multipurpose projects in the basin. Hartwell Dam and Lake (55,950 acre summer pool) is located 89 miles upstream of Augusta and was filled in 1962. RBR Dam and Lake (26,650 acre summer pool) is located 59 miles upstream of Augusta and was filled in 1984. JST Dam and Lake (70,000-acre summer pool) is located 22 miles upstream of Augusta and was filled in 1954.


J. S. Thurmond Lake and Dam


New Savannah Bluff Lock and Dam

The authorized project for the Savannah River between Augusta and Savannah, Georgia, provides for a navigation channel 9 feet deep and 90 feet wide from the upper end of Savannah Harbor (mile 21.3) to the head of navigation just below the 13th Street bridge in Augusta (mile 202.2). This is a distance of 180.9 miles. The project also includes the lock and dam at New Savannah Bluff, located about 12 miles downstream from Augusta. Channel modifications, including deepening, widening, snagging, construction of bend cutoffs, and construction of pile dikes, were made on the river to provide the 9-foot depth. However, by 1980, shipping on the river had virtually ceased, and channel maintenance was discontinued.

The existing authorized Savannah Harbor Navigation Project provides a channel 44 feet deep and 600 feet wide across the ocean bar; 42 feet deep and 500 to 600 feet wide to the vicinity of Kings Island Turning Basin; and 30 feet deep and 200 feet wide to a point l,500 feet downstream of the Houlihan Bridge (US Highway 17). The terminus of the deep-draft channel in Savannah Harbor is at approximately river mile 21. The project provides turning basins for vessels at various locations in the harbor (Reconnaissance Planning Aid Report on the Savannah River Basin Study, US Fish and Wildlife Service, July 1999).

2.3. RECREATION

The lakes of the Savannah River Basin provide excellent opportunities for water resource-based recreation. However, in times of drought, when the lake levels of Hartwell and JST Lake drop 6 feet below summer pool, drought information sheets are disseminated to the public. These sheets instruct the public to only use marked navigation channels, since unmarked hazards become more prevalent increasing risks of boating accidents outside the channel. In addition, at 6 feet below summer pool, designated swimming areas become dry. However, adverse impacts become noticeable at designated swimming areas when lake levels drop below 3 feet.

According to the Savannah River Basin Water Use Data Collection Presentation of Findings, June 2004, conduct by Zapata Engineering. P.A., for the US Army Corps of Engineers, Savannah District, during periods of low water, approximately 39 percent of the recreational users surveyed said that they would make a water-based recreational trip to the same lake, 41 percent would make a water-based recreation trip elsewhere, and 20 percent would not make a water-based recreation trip. Therefore, during periods of drought, 61 percent of non-drought visitors do not make a water resource-based recreation trip to Hartwell and JST Lakes. Respondents of this survey also indicated that their recreational activities are seriously impacted when lake levels drop an average of 7.5 feet below full pool. According to some lake managers, water recreation is more difficult and less convenient during periods of drought because recreationists may have to travel further distances to a useable ramp for access to the lake, they may consider the lake aesthetically unpleasing and they may recognize the increased risk of damaging their boat and person.

2.3.1. Public Boat-Launching Ramps and Private Docks

Public boat-launching ramps and private docks provide recreational access to the lakes of the Savannah River Basin. The following paragraphs discuss the facilities that exist on the three Corps reservoirs.

Hartwell Lake

There are 95 public boat-launching ramps and marinas located on Hartwell Lake. From lake elevation 660 to 658.01 feet mean sea level (msl) all ramps are useable. At and below lake level 658 feet msl, the first 6 boat-launching ramps become unusable. At and below lake level 657 feet msl, 6 more or a total of 12 boat-launching ramps become unusable. At and below lake level 656 feet msl, one more or a total of 13 boat-launching ramps become unusable. At and below lake level 655 feet msl, 3 more or a total of 16 boat-launching ramps become unusable. At and below lake level 654 feet msl, 1 more or a total of 17 boat-launching ramps become unusable. At and below lake level 653 feet msl, 6 more or a total of 23 (24.2 percent) public boat ramps become unusable, but 72 (75.8 percent) remain serviceable. When lake levels drop to 646 feet msl, 43 (45.2 percent) boat-launching ramps become unusable. If lake levels were to ever drop to 638 feet msl, all the ramps become unusable.

Table 1: Hartwell Lake - Unusable Ramps by Lake Level 658 to 652 feet msl

NAME OF BOAT RAMP	LAKE LEVEL RAMP BECOMES UNUSABLE (feet msl)
Sadlers Creek State Park.	658.0
Tugaloo State Lower	658.0
Jacks Landing, SC	658.0
Holders Access, SC	658.0
Lakeshore	658.0
Mountain Bay	658.0
Reed Creek, GA	657.5
Rocky Ford, GA	657.5
Brown Road, SC	657.0
Hurricane Creek, SC	657.0
Seneca Creek, SC	657.0
Walker Creek, GA	657.0
Cove Inlet, SC	656.5
Durham, SC	655.7
South Union, SC	655.5
Bradberry, GA	655.0
Timberland, SC	654.0
Darwin Wright City Park.	653.0
Tillies, SC	653.0
White City, SC	653.0
Barton Mill, SC	653.0
Port Bass, SC	653.0
Seymour, GA	653.0
Paynes Creek (inner right)	652.6
Paynes Creek (left)	652.6
Big Oak Left Lane (New)	652.5
Tabor, SC	652.5
Townville, SC	652.3
Twelve Mile (new left lane)	652.0
Eighteen Mile Creek	652.0

On October 20, 2008, Lake Hartwell reached a record low and further declines in the pool elevation are expected. As a result of the low water, Savannah District closed all of its boat ramps on Hartwell Lake on October 25, 2008. The District's policy is that three feet of water should be present at the end of a ramp for the safe launching of recreational boats. Gravel had been placed at the end of five ramps to allow their continued use. However, such use is at the boat owner's risk. Those ramps are: Green Pond and Hatton's Ford in Anderson County; Martin Creek in Oconee County; and Big Oaks and Crawford's Ferry in Hart County, Georgia.

There are approximately 10,500 private boat dock permits issued on Hartwell Lake. This number is almost double of what was reported in the March 1989 SRBDCP. In that report, it was roughly estimated that about 50 percent of the docks were unusable below lake level 652 feet msl and about 90 percent were unusable at 643 feet msl. Even with the ability and willingness to chase the water, the percentage of docks now unusable at 652 feet msl would likely be greater than 50 percent, since more developments are located adjacent to shallow cove areas.

RBR Lake

There are approximately 30 public boat-launching ramps on RBR Lake. All of these ramps are useable until lake levels reach 466 feet msl. Lake levels at RBR Lake do not drop more than five feet below full pool. Therefore, public boat-launching ramps on RBR Lake were not adversely impacted during the drought of record.

JST Lake

There are 84 public boat-launching ramps and marinas located on JST Lake. Above lake elevation 326 feet msl to 330 feet msl all ramps are useable and allow for the launching of boats with up to 3 feet of draft. At and below lake level 326 feet msl, the first boat-launching ramp becomes unusable. At and below lake level 325 feet msl, 4 more or a total of 5 boat-launching ramps become unusable. At and below lake level 324 feet msl, 7 more or a total of 12 boat-launching ramps become unusable. At and below lake level 323 feet msl, 5 more or a total of 17 (20 percent) boat-launching ramps become unusable while 67 (80 percent) remain useable. At and below lake level 317 feet msl, 33 (39 percent) boat-launching ramps become unusable. At and below lake level 315 feet msl, 46 (55 percent) boat-launching ramps become unusable. All boat-launching ramps would become unusable at 306 feet msl.

Table 2: J.Strom Thurmond - Unusable Ramps by Lake Level 326 to 317 feet msl

NAME OF BOAT RAMP	LAKE LEVEL RAMP BECOMES UNUSABLE (feet msl)
Wildwood Park (5 ramps)	326.0
Hwy 28 Access Ramp	326.0
Long Cane Creek Ramp	325.7
Catfish Ramp	325.5
Calhoun Falls Ramp	325.0

NAME OF BOAT RAMP	LAKE LEVEL RAMP BECOMES UNUSABLE (feet msl)
Broad River Campground	325.0
Double Branches Ramp	324.8
Cherokee Recreation Area (2 lanes)	324.7
Mistletoe State Park (2 lanes)	324.2
Soap Creek Park	324.0
Little River Quarry Ramp	324.0
Scotts Ferry (New Ramp)	323.8
Leroys Ferry Campground	323.6
Clay Hill Campground	323.5
Winfield Subdivision (2 lanes)	323.1
Mt Pleasant Ramp	322.4
Bussey Point	321.0
Chamberlain Ferry Ramp	321.0
Modoc Campground	321.0
Murray Creek Ramp	321.0
Parkway Ramp	321.0
Fishing Creek/Hwy 79 Ramp	320.7
Soap Creek Subdivision	320.0
Scotts Ferry (New Ramp)	318.8
Wildwood Park (2 lanes)	315.0
Wildwood Park (2 lanes)	317.0
Wildwood Park (2 lanes)	320.0
Cherokee Recreation Area (2 lanes)	318.2
Soap Creek Marina	318.0
Raysville Marina	317.6
Soap Creek/Hwy 220 Ramp	317.0

There are approximately 1,851 private boat docks on the JST Lake. This is a 25 percent increase from the SRBDCP report. In that report, at 322 feet msl, about 50 percent of the docks were considered unusable. At 313 feet msl, 95 percent of the private docks were considered as unusable. Even with the ability and willingness to chase the water, the percentage of docks now unusable at 322 feet msl would likely be greater than 50 percent, since newer developments are located in shallower coves.

2.3.2. Swimming

Swimming areas on the Corps reservoirs are mainly used from May through September. The following paragraphs discuss the facilities that exist on the three Corps reservoirs.

Hartwell Lake

At Hartwell Lake, there are 22 Corps of Engineers' operated swimming beach areas located in 13 recreation areas. When lake levels reach 654 feet msl, all designated swimming areas are dry. However, when the lake level drops below 657 feet msl, swimming areas become less desirable due to the reduced water area available for swimming. When this happens, swimming occurs outside the designated swimming area, increasing the risk of fatalities. During the 1986 drought, when swimming beaches were unusable, recreation fatalities for swimming activities increased from three to nine. They fell to zero when the beaches were back in service in 1987.

RBR Lake

At RBR, there are no Corps of Engineers' operated designated swimming areas.

JST Lake

At JST Lake, there are 18 Corps of Engineers' operated swimming beach areas. When lake levels reach 324 feet msl, the designated swimming areas are dry. However, when the lake level drops below 327 feet msl, swimming areas beaches become less desirable due to the reduced water area available for swimming. When this happens, swimming occurs outside the designated swimming area, increasing the risk of fatalities.

2.4. WATER SUPPLY

Hartwell Lake

There are 8 water supply users on Hartwell Lake. The highest intake elevation is 638.33 feet msl, while the lowest is 610.00 (SRBDCP, March 1989).

RBR Lake

There are 6 water supply users on RBR. The highest intake elevation is 468.8 feet msl, while the lowest is 454.75 (SRBDCP, March 1989).

JST Lake

There are 8 water supply users on JST Lake. The highest intake elevation is 318.0 feet msl, while the lowest is 307.0 (SRBDCP, March 1989).

Downstream of JST Lake

Sixteen major water supply users exist downstream of Thurmond Dam. The major municipal users occur at Augusta and near the coast. The City of Augusta operates and withdraws water from the Augusta Canal. The City of North Augusta withdraws water from the pool upstream of the New Savannah Bluff Lock and Dam (roughly river mile 187.5). The Beaufort-Jasper County Water Supply Authority withdraws water at river mile 39.3, while the City of Savannah's M&I Plant is located on Abercorn Creek, approximately at river mile 29. The other municipal users consist of Columbia County and Edgefield County.

Industrial users with intakes in the New Savannah Bluff Lock and Dam (NSBL&D) pool include North Augusta, Mason's Sod, Kimberly Clark, Urquhart Station, PCS Nitrogen, DSM Chemical and General Chemical, and South Carolina Electric and Gas. Users below NSBL&D include International Paper, Savannah River Site, Plant Vogtle, Savannah Electric – Plant McIntosh, Georgia-Pacific, and the Savannah National Wildlife Refuge.

2.5. HYDROPOWER AND PUMPED STORAGE

The Southeastern Power Administration (SEPA) markets hydropower generated at Hartwell, RBR and JST lakes and dams. SEPA markets the energy through contracts negotiated between SEPA and certain preference customers. There are ten hydropower facilities included in the contract that provide the energy and capacity requirements of the contract. These projects are located in the Savannah, Alabama-Coosa, and Apalachicola-Chattahoochee-Flint Basins. Under normal conditions, if a certain basin or portion of a basin is unable to meet the demands expected, then that shortage can usually be transferred to, or "made up" in, another basin. However, a drought of record situation that adversely impacts all three basins affects SEPA's ability to meet the minimum contract requirements. SEPA may purchase replacement energy for the system generation when the Corps does not generate enough power to meet the requirements of SEPA's contract. They purchased substantial amounts of power in 2007 and 2008 to meet their contract requirements.

The RBR Pumped Storage Project began commercial operation in July 2002. Current operation of the four pumped storage units includes several operational restrictions to minimize fish entrainment and fishery habitat impacts. These operational restrictions include:

- Pumped storage operations will occur only during the hours beginning one hour after official sunset to one hour before official sunrise.
- Pumped storage operations will include a maximum of one unit operation in March and no pumped storage operations in April (not applicable to Drought Level 2 and below).
- Pumped storage operations will include a maximum of one unit operation from May 1 to May 15; a maximum of one unit operation from May 16 to May 31, except when a Level I drought is declared in accordance with this plan, during which time a maximum of two pumped storage units may be used. There shall be no seasonal pumped storage operational restrictions when a Level II drought is declared in accordance with this plan.
- From May 16 to May 31, the District will conduct a minimum of six unit hours of generation, of not less than 60 megawatts, within the twelve hours preceding any two unit pumped storage operation. From June 1 to September 30, the District will conduct a minimum of six unit hours of generation, of not less than 60 megawatts, within the twelve hours preceding any pumped storage operation.

In addition to the restrictions above, all other operational and monitoring restrictions outlined in the August 1999, Final Environmental Assessment and FONSI for the Richard B. Russell Dam and Lake Project, Pumped Storage, will remain in effect.

2.6. WATER QUALITY IN THE LAKES

Generally, water quality in the lakes is at or above State Water Quality Standards. However, like most deep reservoirs in the southeastern United States, they experience thermal stratification. This natural phenomenon results from the difference in densities between the surface and subsurface water caused by the temperature variation in the water column. As the tributary and surface waters warm, the difference in density between the surface and bottom waters begins to restrict vertical circulation of the lake. The result of this restriction of circulation is the development of three layers of water: the epilimnion, the well-mixed surface layer which receives oxygen from interaction with the atmosphere; the hypolimnion, the bottom strata which is essentially stagnant water in which the dissolved oxygen (DO) is slowly depleted by the respiration and decomposition of organic matter; and the thermocline, which is the transition between the upper and lower strata and which exhibits the maximum temperature gradient.

The stability of the lake during stratification increases throughout the summer months as the density gradient intensifies. As winter approaches, cooling of the surface waters causes them to become denser. When temperatures are sufficiently reduced, these waters fall below the thermocline, thereby breaking the stratification. After the fall "overturn," the lake becomes isothermal, with free circulation of water throughout the lake (Hartwell Major Rehabilitation Program Evaluation Report, US Army Corps of Engineers, Savannah District, 1995).

For example, thermal stratification begins in Hartwell Lake in late April and early May of each year. The thermocline is established at a depth of about 30 feet and is maintained at that depth through early August. The thermocline moves to a depth of about 40 feet in late August/early September and to about 50 feet in late September/early October. In late October/early November, as the lake "overturns," the thermocline moves to a depth of about 70 feet and the lake becomes isothermal by early December.

The hypolimnion is typically below the euphotic zone and, lacking free circulation with surface waters, has no potential to renew DO concentrations which are gradually exhausted through respiration and decomposition. As the DO concentrations decrease, a maximum DO gradient develops in the area of the thermocline.

The DO of the top layer remains relatively constant, about 7 mg/l, as the DO of the bottom layer decreases. The level of the maximum DO concentration gradient is established at a depth of about 30 feet in July, moves to a depth of about 40 feet in August, and to 55 or 60 feet in late September. By the first of August, there is usually a 3 mg/l difference between the DO in the upper and lower layers; and by the middle of September, the DO in the lower layer can range between 0 and 2 mg/l. The water quality of the lower layer continues to deteriorate until the fall "overturn" occurs. As "overturn" occurs, the level of the maximum DO concentration gradient falls to 80 feet in October and near the lake bottom in early December, after which the DO concentration is nearly the same at all levels until the following spring (Hartwell Major Rehabilitation Program Evaluation Report, US Army Corps of Engineers, Savannah District, 1995).

RBR Lake uses a hypolimnetic DO system that maintains DO concentrations at or above 5 mg/l throughout the year. Because water released through Hartwell Dam for hydropower comes from the low DO layer, negative effects on the aquatic environment in the Hartwell tailwater area can result. The Corps has installed modifications, referred to as "turbine venting", that allow air to be diffused into the water as it flows past the turbines during generation. The result is a much needed increase of at least 2 mg/l in dissolved oxygen levels in the tailwater. DO concentrations of the release waters from Hartwell can be expected to be below 5 mg/l from late summer through early fall, with the lowest readings from August through September.

The turbines at Thurmond Dam were recently replaced during a major rehabilitation effort that began with the first new turbine being installed in 2002. The new turbines include a self-aspirating design that is a form of turbine venting. The new turbines now add as much as 3 mg/l of DO to the waters as they pass through the dam. Since the rehabilitation was complete in 2007, discharges from Thurmond Dam possess at least 3 mg/l of DO throughout the year. Construction of an oxygen injection system is underway at Thurmond Lake. Operation of this system will increase the DO of waters within the lake, as well as those which pass through the dam to flow downstream. When the DO injection system becomes operational in 2010, the release waters from Thurmond can be expected to possess at least 5 mg/l of DO throughout the year.

2.7. WATER QUALITY IN THE SAVANNAH RIVER

The Savannah River below JST Dam is classified as "Freshwater" by the South Carolina Department of Health and Environmental Control (DHEC) (Savannah Watershed Water Quality Assessment 2003). This designation is defined as:

> "Freshwaters suitable for primary and secondary contact recreation and as a source for drinking water supply after conventional treatment in accordance with the requirements of the Department. These waters are suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of fauna and flora. This class is also suitable for industrial and agricultural uses."

The Georgia Environmental Protection Division (EPD) of the Georgia Department of Natural Resources (DNR) has classified the designated use of the main river as "Fishing" waters. The water quality standards for dissolved oxygen, as stated in Georgia's Rules and Regulations for Water Quality Control (GA EPD, 2004), Chapter 391-3-6-.03(6)(c)(i), that this classification requires are:

> "A daily average of 5.0 mg/L and no less than 4.0 mg/L at all times for waters supporting warm water species of fish".

Aquatic life and recreational uses are not fully supported along the main length of the Savannah River. Both South Carolina and Georgia have at least portions of the Savannah River (Thurmond Dam to Interstate 95) on their 2008 Section 303(d) List of Impaired Waters.

SC states that aquatic life is impaired due to levels of zinc, while fishing is impaired due to levels of mercury. South Carolina DHEC issued a fish consumption advisory in 1996 for the main Savannah River (Thurmond Dam to Interstate 95) because of concerns about mercury, Cesium-137, and Strontium-90. The advisory also states that some fish also contain cesium-137 and strontium-90. The levels of these radioisotopes in fish are low and have decreased over time.

The GA Section 303(d) list states that drinking water is impaired from J. Strom Thurmond Dam to the Stevens Creek Dam due to low levels of dissolved oxygen, most likely as a result of releases from the dam. Savannah District expects to complete installation of a DO injection system within Thurmond Lake in 2010. When this system becomes operational, discharges from Thurmond Dam are expected to contain at least 5 ppm of DO throughout the year. That level would meet both the Georgia and South Carolina standard for DO levels for those waters.

The GA Section 303(d) list includes numerous tributaries as not meeting the designated use of Fishing for a variety of reasons, including primarily low DO or high levels of fecal coliform. GA lists the main river (Stevens Creek Dam to Tidegate) as meeting its designated uses of Drinking Water, Fishing, or Coastal Fishing. It states that Coastal Fishing is impaired from GA Highway 25 (Houlihan Bridge) to Elba Island Cut (roughly RM 4) due to low levels of DO.

Environmental Protection Agency (EPA) has prepared the following Total Maximum Daily Loads (TMDLs) for portions of the Savannah River:

- Fecal coliform – Savannah River in Richmond County
- Lead – Savannah River between Butler & McBean Creeks
- Dissolved Oxygen – Savannah River from the Seaboard Coastline Railroad Bridge (RM 27.4 to the coast)

South Carolina DHEC classifies the estuarine portion of the river as SB: "Tidal saltwaters". This designation is defined as:

> "… suitable primarily for primary and secondary contact recreation, crabbing and fishing. These waters are not protected for harvesting of clams, mussels, or oysters for market purposes or human consumption. The waters are suitable for fishing and the survival and propagation of a balanced indigenous aquatic community of marine fauna and flora."

The Georgia DNR-EPD has classified the designated use of the estuarine portion of the river as "Coastal Fishing."

Seasonal DO sags occur in the summer months in the estuarine portion of the river. EPA's TMDL for dissolved oxygen calls for zero discharge of oxygen-depleting substances from Augusta to the coast. The states are presently working with EPA to implement this requirement.

The State of South Carolina uses the current drought plan Level 3 flow of 3,600 cfs (Larry Turner, South Carolina DHEC) at the Savannah River Augusta gage for the permitting of point source discharges in the Augusta area and this flow is adjusted upward to account for tributary

input as one moves down the river. The State of Georgia uses the 7Q10 values of 3,800 cfs at the Augusta gage, 4,160 cfs further downstream at the Millhaven gage and 4,710 cfs at the Clyo gage in its decisions on the permitting of point source discharges (Paul Lamarre, Georgia DNR-EPD).

2.8. BIOTIC COMMUNITIES AT THE LAKES

2.8.1. Fishery Resources at Hartwell Lake

Hartwell Lake and its tailrace provide a vast habitat for both warmwater and coldwater fisheries. The lake area supports a large warmwater fishery including such species as white and striped bass, hybrid bass, largemouth bass, bluegill, pumpkinseed, redear sunfish, yellow perch, sauger, walleye, and catfish. Nongame species found within the lake include blueback herring, carp, longnose gar, redhorse and spotted sucker. The GADNR and SCDNR both actively stock, on average, 500,000 to 1,000,000 striped bass and hybrid bass in Hartwell Lake.

The Hartwell tailrace supports a coldwater put and take trout fishery that is supported by stocking from both States. The State of Georgia DNR-EPD classifies the Savannah River in Hart County (which includes the Hartwell tailrace) as Secondary Trout Waters. These waters are described as those waters in which there is no evidence of natural trout reproduction, but they are capable of supporting trout throughout the year. Striped bass and walleye are also found in this coldwater fishery.

Study findings indicate that blueback herring habitat becomes quite restricted during lake stratification due to the DO and temperature requirements of the fish. The results of these stratification conditions are the congregation of herring in the penstock area and fish kills from entrainment (Alexander, et.al., 1991). Operational procedures are followed by Savannah District to minimize this entrainment.

2.8.2. Fishery Resources at RBR Lake

The fishery resources of RBR have been extensively studied. Savannah District and the University of Georgia Cooperative Fish and Wildlife Research Unit (GA COOP), began baseline studies of fishery resources in RBR Lake in 1990. These studies included cove rotenone sampling, gill net sampling, electrofishing, and telemetry. Savannah District has also conducted hydroacoustic surveys of the fishery resources in the RBR tailrace since 1986, and lakewide hydroacoustic surveys of RBR Lake in 1997. South Carolina DNR has conducted fisherman creel surveys on RBR since 1991. Georgia DNR has conducted fisherman creel surveys in the RBR tailrace since 1988.

RBR Lake supports a wide variety of fish species. The more common species include; largemouth bass, spotted bass, redeye bass, threadfin shad, gizzard shad, blueback herring, bluegill, redear sunfish, channel catfish, brown bullhead, black crappie, yellow perch, white perch, spotted sucker and common carp. Small numbers of hybrid bass (striped bass x white bass) and striped bass are caught each year in RBR Lake.

2.8.3. Fishery Resources at JST Lake

The fishery resources of JST have been extensively studied. Savannah District and the GA COOP began baseline studies of fishery resources in JST Lake in 1986. These studies included cove rotenone sampling, gill net sampling, electrofishing, and telemetry. The Clemson University Cooperative Fish and Wildlife Research Unit (CU COOP) conducted a commercial creel estimate and a population estimate of blueback herring. Savannah District has conducted lakewide hydroacoustic surveys of the forage fish populations in 1996. South Carolina DNR has conducted fisherman creel surveys on JST since 1991.

The more common fish species in JST Lake include; largemouth bass, bluegill, redear sunfish, hybrid bass, striped bass, black crappie, brown bullhead, channel catfish, flathead catfish, white perch, yellow perch, threadfin shad, gizzard shad, and blueback herring. South Carolina DNR and Georgia DNR both actively stock hybrid bass and striped bass in JST Lake. On average, 750,000 to 1,000,000 striped and hybrid bass have been stocked annually in JST Lake.

The RBR tailrace supports a substantial fishery for striped bass, hybrid bass, and white perch. This area makes up only 2 percent of the surface area of JST Lake, but accounts for 9-11 percent of the total harvest of these species. Fish abundance in the RBR tailrace generally peaks in the summer and is lower in the winter. A commercial fishery for blueback herring exists in the RBR Tailwater. Blueback herring are used by fishermen as bait in both Georgia and South Carolina. Recreational fisherman also net blueback herring in the RBR tailrace and in JST Lake for their personal use as bait.

2.8.4. Aquatic Plants at Hartwell Lake

Aquatic plants have not become abundant in Hartwell Lake. However, there is concern that hydrilla will be moved from J. Strom Thurmond Lake or Keowee Lake into Hartwell Lake. Periodic boat surveys of the lake were performed throughout the 2007 growing season. The distribution and abundance of water primrose in Eighteen Mile Creek does not appear to have increased relative to previous years. During a routine patrol of the Seneca River, a small 4’ X 4’ patch of hydrilla was located between the Hwy 93 Bridge and Hwy 123 Bridge in Pickens County, SC. Due to dropping water levels the hydrilla was exposed within a week of it first being discovered and it was not treated. The area was monitored for several days and the hydrilla appeared to have died due to desiccation. The entire area between the two bridges was surveyed thoroughly and no additional hydrilla was found. Aquatic plant growth has not reached nuisance levels requiring treatment. Executive Order 13112-Invasive Species directs federal agencies to take actions, such as preventing the introduction of invasive species and controlling populations of the species in a cost-effective and environmentally sound manner.

2.8.5. Aquatic Plants at RBR Lake

Boat surveys are conducted periodically throughout the summer and fall to determine plant distribution and abundance. Hydrilla was discovered in Richard B. Russell Lake during the summer of 2002, but it has not reoccurred since that time. Approximately 20 acres of Brazilian elodea (Egeria densa) was present in 2005, with an increase in distribution and abundance from 2004. Approximately 5 acres were observed in 2006 in the Dry Fork Creek area of the Savannah

River. Sparse patches were present on the Savannah River 1 to 2 miles below Hartwell Dam. This species was not as abundant in 2007 as it was in 2005 and 2006.
Aquatic plant growth has not reached nuisance levels requiring treatment. Executive Order 13112-Invasive Species directs federal agencies to take actions, such as preventing the introduction of invasive species and controlling populations of the species in a cost-effective and environmentally sound manner.

2.8.6. Aquatic Plants at JST Lake

The Thurmond Project staff monitors the abundance and migration of hydrilla in the reservoir. One of two herbicides are selected and used for control based upon site location, desired level of control, and cost per acre. Changes in the proposed treatment program are coordinated with the GA DNR, SC DNR, and affected outgrantees prior to implementation.

Hydrilla is present along approximately 6,497 acres of shoreline, including approximately 372 miles of shoreline in Georgia (4,520 acres) and 164 miles of shoreline in South Carolina (1,978 acres). These estimates are based on the presence of infestations noted since the introduction of hydrilla and the annual survey of areas not previously impacted by hydrilla to determine the presence of additional infestations. This represents approximately 9.2 % of the total lake surface at normal summer elevation of 330 feet msl that may be impacted once the lake returns to normal level.

Hydrilla is present in areas of suitable substrate throughout Little River, GA from the confluence of the Savannah River to upstream of Raysville Campground including most tributaries. Along the Savannah River portion of the lake, hydrilla is present on the Georgia side from the dam to Elijah Clark State Park. On the South Carolina side, it is present from the dam to Hickory Knob Subdivision, including most tributaries. Hydrilla was found along both sides of Little River, SC from the Savannah River to below the Highway 378 bridge.

The growth rate and distribution of hydrilla was monitored throughout the summer. Through most of the growing season, the lake level was 3 to 9 feet below normal summer pool. The abundance of hydrilla varied greatly from area to area. Many areas that were previously heavily infested showed no or minimal re-growth. In a few areas, hydrilla was topped out in 2 to 10 feet of water.

Hydrilla was treated at seven boat ramps and/or marina basins to minimize user impacts. Seven permits were issued to adjoining property owners to treat hydrilla around their docks. A total of 8.5 acres was treated.

During late November 2007, with assistance from South Carolina Department of Natural Resources personnel, inspections of the shoreline areas were made in areas where hydrilla had not been previously found. The low lake level made it possible to locate new plant populations

that have become established from 10 to 15 feet below the normal pool elevation. New infestations of hydrilla varied from small patches to well established populations. Significant new infestations of hydrilla were found in the following areas:

LOCATION	COUNTY	STATE
Along the Savannah River from Little River Subdivision to Savannah Lakes Marina	McCormick	SC
Benningsfield and Dordon Creeks	McCormick	SC
Hickory Knob State Park and Hickory Knob Subdivision	McCormick	SC
Soap Creek from Soap Creek Subdivision to Hwy 378 Bridge	Lincoln	GA
Wells Creek	Lincoln	GA
Mistletoe State Park / Cliett Creek	Columbia	GA

Executive Order 13112-Invasive Species directs federal agencies to take actions, such as preventing the introduction of invasive species and controlling populations of the species in a cost-effective and environmentally sound manner.

2.8.7. Aquatic Plants at New Savannah Bluff Lock and Dam

Aquatic plant populations in the upstream embayment were monitored periodically throughout the 2008 growing season. The following aquatic plants were identified: waterhyacinth, elodea, fanwart, pickerelweed, and cattail. None appeared to pose any problems to operation of the structure or uses of the area.

2.9. BIOTIC COMMUNITIES IN THE LOWER SAVANNAH RIVER

2.9.1. Fish

Riverine fish habitats in the Savannah River have been highly modified or converted to lacustrine habitat by construction of major dams and reservoirs that inundate the upper half of the River Basin. This large-scale habitat conversion has changed the relative abundance and diversity of fish species from a system dominated by migratory diadromous fish to more localized riverine and lacustrine-dominated fish communities. A comprehensive five-year fishery survey of existing coastal plain habitats concluded that the lower Savannah River supports an abundant, diversified fish community, but has a low to moderately used fishery (Schmitt and Hornsby 1985). Based on numbers and weight collected the most abundant game fish were largemouth bass, chain pickerel, black crappie, yellow perch, redbreast sunfish, bluegill, redear sunfish, warmouth, flier, and pumpkinseed. Important non-game fish include longnose gar, bowfin, white catfish, channel catfish, common carp, spotted sucker, silver redhorse, robust redhorse, striped mullet, and brown bullhead. In numerical terms the most important forage fish are gizzard shad and a number of minnow species. Diadromous fishes inhabiting the lower Savannah River include striped bass, American shad, hickory shad, blueback herring, shortnose sturgeon, Atlantic

sturgeon, and the catadromous American eel. The present-day Savannah River population of striped bass appears to be more riverine in its habitat use patterns than more northern populations that are truly anadromous.

Prior to construction of mainstem Savannah Dams from 1840 to 1984, diadromous fish migrations extended throughout the Piedmont. Historical records document the upstream migration of shad and striped bass to the headwaters of the Savannah River, through the Tugaloo River and up the Tallulah River to Tallulah Falls, Georgia, approximately 384 river miles from the ocean. Sturgeon is known to have migrated well into the Piedmont. A portion of the river was diverted in 1846 at the site of the Augusta Diversion Dam. In 1875, that structure was extended to the entire channel width to create the present Augusta Diversion Dam. That structure restricted inland migration of diadromous species except during high flow periods when the Dam was overtopped. When those conditions occurred, some fish species could continue their upstream migrations. A fish ladder was installed in 1886, but it is presently not considered to be effective in passing fish upstream. Completion of the New Savannah Bluff Lock and Dam (NSBLD) in 1937 further restricted spawning migrations in many years to below river mile 265, with the exception of high flow periods that occurred during the spawning season. During the late 1950's through the early 1960's, the Corps' Savannah River navigation project constructed 38 cuts across meander bends that shortened the river by 78 miles. As a result of these cutoffs, the NSBLD is now located at river mile 187.3. The Stevens Creek Dam, a South Carolina Electric and Gas hydroelectric project, was constructed 0.9 miles upstream of the Augusta Diversion Dam in 1914, blocking all diadromous fish migrations past that point.

Although greatly reduced from former abundance, diadromous fish are an important and increasing component of the River's sport and commercial fisheries. American shad, blueback herring, and lesser numbers of striped bass and sturgeon migrate to the NSBLD facility, which is the first major obstruction to passage on the river. Some fish have continued to migrate to historical spawning grounds above the facility. Some species pass upstream by swimming through fully-opened dam gates at flows of 16,000 cfs or higher, and by swimming through the navigation lock when it is operated in a manner suitable for fish passage. The NSBLD restricts passage of sturgeon to periods when high flows overtop the riverbanks during the spawning season. In 2006, The Nature Conservancy the monitored the movement of tagged shortnose sturgeon fish when flows exceeded the height of the dam but stayed within the river banks. TNC could not identify any passage of shortnose sturgeon upstream of the NSBLD under those flow conditions. Without access to the upstream shoal spawning habitat, gravel bars downstream of the NSBLD likely represent the only remaining spawning habitat for shortnose sturgeon in the Savannah River. Shortnose sturgeon and other important species have been identified at gravel bars downstream of the NSBLD (river miles 179-190, 275-278, and 286) during spawning months of February and March (Hall and Lamprecht, 1991, Grabowski and Isely, 2006, and Wrona, unpublished data). Research conducted in 1999-2000 (Collins et al 2002) indicate there has been no increase in recruitment of shortnose sturgeon into the population over the previous 8 years, but that an observed increased number of shortnose in the river was due to the stock enhancement program conducted by SC DNR from 1990-1992.

Presently the lower Savannah River provides extremely important striped bass habitat. Although the majority of historical upstream spawning habitat for striped bass has been inundated by

major reservoirs, some remaining rocky rapids habitat exists in the Augusta Shoals from just below NSBLD up to Stevens Creek Dam. After construction of mainstem dams and prior to initiation of a Tidegate operation in 1977, the primary spawning area for striped bass in the Savannah River system was the tidal fresh water zone approximately 18-25 miles from the river mouth, specifically the Little Back River (McBay 1968; Rees 1974). Salinity changes due to the Tidegate operation (1977-1992) reduced the extent of this tidal freshwater zone. Studies indicated significant declines in numbers of striped bass eggs and larvae in the lower Savannah River system during this period. These declines were related to increased salinity and modified transport patterns caused by the Tidegate and associated hydrologic modifications (Van Den Avyle et al. 1990, Winger and Lasier 1990).

The Little Back River, adjacent to the lower Savannah River, had unique physical characteristics that made it the primary source in the Savannah River System for efficient collection of brood fish for the Georgia statewide propagation and stocking program of striped bass and hybrid bass (white bass x striped bass). It has not served in that capacity since the 1980's. The GADNR adopted a striped bass harvest moratorium in 1988. In the early 1980's, an average of 4,291 kilograms of striped bass were harvested annually by sport fishermen in the Savannah River downstream of the NSBLD (Schmitt and Hornsby 1985). As a result of increasing numbers of mature striped bass being observed in the estuary, both SC and GA recently opened the fishery for that species in the estuary.

The Corps of Engineers, Georgia Department of Natural Resources, South Carolina Department of Natural Resources, US Fish and Wildlife Service, and the National Oceanic and Atmospheric Administration Fisheries Service are actively coordinating with private sector partners to address enhancement and restoration of diadromous fisheries, wetlands, and other aquatic resources in the Savannah River.

2.9.2. Wetlands

Palustrine forested wetlands dominate the extensive alluvial plain of the Savannah River. The wettest parts of the flood plain, such as swales, sloughs, and back swamps are dominated by bald cypress, water tupelo, and swamp tupelo. Slightly higher areas, which are usually flooded for much of the growing season are often dominated by overcup oak and water hickory. Most of the Savannah River floodplain consists of low relief flats or terraces. These areas are flooded during most of the winter and early spring and one or two months during the growing season. Laurel oak is the dominant species on these flats and green ash, American elm, sweetgum, spruce pine, sugarberry, and swamp palm are often present. Swamp chestnut oak, cherrybark oak, spruce pine, and loblolly pine are found on the highest elevations of the flood plain, which are only flooded infrequently during the growing season.

On the Savannah River downstream of Interstate Highway 95, tidal palustrine emergent wetlands, also known as tidal freshwater marsh, become prevalent. Tidal palustrine emergent wetlands are flooded twice daily by tidal action in the study area. These marshes are vegetated with a diverse mixture of plants including giant cutgrass, spikerushes, and up to 58 other plant species (Pearlstine et al. 1990, Applied Technology and Management 1998).

In palustrine emergent wetlands, primary productivity is high, falling in the range of 500 to 2,000 grams/square meter/year (Odum et al. 1984). The quality of primary production is also high. Major primary producers in the salt marsh community are grasses that have little immediate nutritional value to fish and wildlife but support an important detritus based food web (Teal 1962). In contrast, the fleshy broad-leaf plants characteristic of fresh marshes generally are high in nitrogen and low in fiber content and there is a high incidence of direct grazing or feeding on these plants (Odum et al. 1984).

Freshwater marsh vegetation also contributes to the food web base that supports the study area's freshwater fishery. The leaves of the larger macrophytes in this community are used as attachment places by mollusks, insect nymphs, rotifers, hydra, and midge larvae. These are all important fish foods. The submerged littoral zone is vital to the development of freshwater fish, as well as some marine and estuarine species, as these areas are the principal spawning sites and provide nursery and juvenile habitats.

2.9.3. Wildlife

Wildlife associated with forested wetlands is numerous and diverse. The furbearers are an important component of these wetlands and include beaver, muskrat, mink, otter, bobcat, gray fox, raccoon, and opossum. Deer, turkey, and even black bear in the more isolated areas, use the bottomlands. Palustrine emergent wetlands also provide excellent habitat for furbearers including the mink, beaver, and river otter. Terrestrial species from surrounding areas often utilize the fresh marsh edge for shelter, food, and water. These include raccoon, opossum, rabbit, and bobcat.

The study area is part of the Atlantic Flyway and forested wetlands provide important wintering habitat for many waterfowl species and nesting habitat for wood ducks. Many species of woodpeckers, hawks, and owls use the bottomlands and swamps. Neotropical migratory birds, many of which are decreasing in abundance, depend upon contiguous tracts of forested swamps for breeding and as corridors during migration. Robbins et al. (1989) found that the most area-sensitive bird species required at least 2,800 acres of contiguous forest to be present. The extensive forested wetlands of the Savannah River flood plain provide very valuable habitat for these birds. The American swallow-tailed kite, a state (South Carolina) listed endangered species, can be observed on the study area. Swallow-tailed kites nest in and are closely associated with palustrine wetlands.

Palustrine emergent wetlands also provide habitat for many bird species. Resident, transient, and migrating birds of both terrestrial and aquatic origin utilize food and shelter found in this community. Some species use freshwater marshes for nesting and breeding. Waterfowl feed upon fresh marsh vegetation, mollusks, insects, small crustaceans, and fish found in the fresh

marsh community. Wading birds such as the wood stork, great blue heron, little blue heron, green heron, snowy egret, and great egret also heavily utilize the tidal freshwater marsh.

The study area provides excellent habitat for a large number of reptiles and amphibians. Wetland habitats support many kinds of frogs including the bullfrog, bronze frog, southern leopard frog, several species of tree frogs, cricket frogs, and chorus frogs. Turtles found in the wetlands include the river cooter, Florida cooter, pond slider, eastern chicken turtle, snapping turtle, mud turtle, and stinkpot. Snakes found in the wetlands include the red-bellied water snake, banded water snake, brown water snake, eastern mud snake, rainbow snake, and eastern cottonmouth. The American alligator can be observed on streams and ponds of the Coastal Plain study area.

In 2006, the Fish and Wildlife Service conducted a freshwater mussel survey in the Savannah River to determine species composition and distribution of mussels. This study encompassed the portion of the river from the Augusta Shoals region (river mile 203) near the Fall Line downstream to the tidewater region (river mile 22.8) near Savannah. This survey evaluated 39 sites using both shallow water (snorkeling and grubbing) and deep water (SCUBA) survey techniques. A total of 26 freshwater mussel species were identified during the survey efforts. With the exception of sites within the Augusta Shoals area, mussels were generally unevenly distributed in the surveyed areas, which is reflective of the distribution and quality of microhabitats within a particular river segment. In general mussels were most abundant in the thalwag habitats at the base of the river bank, and rare to absent in the shifting sand dominated runs in the center of the channel.

Atlantic pigtoe (*Fusconaia masoni*) and Savannah liliput (*Toxolasma pullus*) were both observed in the 2006 mussel survey. Both of these species are experiencing range-wide declines. Atlantic pigtoe was found only in the Augusta shoals. This species has not been observed in any other Georgia or South Carolina Rivers in the many years. The population of Savannah liliput upstream of Little Hell boat landing (Allendale County) may be the largest remaining population of this species.

The 2006 discovery of four species not previously known to occur in South Carolina demonstrates the gross lack of knowledge regarding the mussel fauna of the Savannah River. The objective of the 2006 mussel survey was an attempt to estimate species composition and distribution in the Savannah River, but the surveyors only visited a small portion of the available habitat in the river.

Savannah liliput in the Savannah is found primarily in cutoff bends and sloughs. Preliminary observations indicate that much of this 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.

2.9.4. Endangered Species

Federal Endangered, Threatened, and Candidate species that are likely to occur in the Savannah River Basin Study area are listed in Table 3 (Reconnaissance Planning Aid Report on the Savannah River Basin Study, US Fish and Wildlife Service, July 1999). State species are listed in Table 4.


Wetland Habitat

2.9.5. Special Biological Areas

The tidal fresh marsh at the Savannah National Wildlife Refuge (NWR) supports an extremely diverse plant community providing food, cover and nesting habitat for a wide variety of wildlife species. Tidal freshwater marsh is relatively scarce in comparison to coastal brackish and salt marshes. Past harbor modifications, including harbor deepening, have greatly increased salinity levels throughout much of the Savannah NWR and reduced the quantity of tidal freshwater marsh. According to the USFWS, the Savannah NWR contained about 6,000 acres of tidal freshwater marsh when it was established in 1927. By 1997, due to the cumulative impacts of harbor deepening, tidal freshwater marsh had declined to 2,800 acres, a reduction of 53 percent (Reconnaissance Planning Aid Report on the Savannah River Basin Study, US Fish and Wildlife Service, July 1999). The freshwater marsh areas had historically been bottomland hardwoods, but were cleared in the 1800's for agricultural purposes, such as the rice culture. The leveled and diked areas were abandoned when the rice culture was no longer profitable after the Civil War. Those sites partially filled and now support a wide variety of plant and animal species.

Prior to 1977, the Savannah River supported the most important naturally reproducing striped bass population in the State of Georgia, but production of striped bass eggs in the Savannah River estuary declined by about 95 percent. Operation of the Tidegate, in conjunction with the cumulative impacts of harbor deepening, caused a number of impacts. These included increases in salinity and loss of suitable spawning habitat throughout most of Little Back River and the lower Savannah River (Reconnaissance Planning Aid Report on the Savannah River Basin Study, US Fish and Wildlife Service, July 1999). It was hoped that the Tidegate restoration project would improve most of these conditions. Annual stocking efforts by the GA DNR have been very successful in increasing the number of striped bass in the lower Savannah River, and current population levels approach historic levels. After a 17-year closure, the striped bass fishery was reopened in October 2005.

2.10. SOCIOECONOMIC ISSUES

2.10.1. Environmental Justice

The concept of environmental justice is based on the premise that no segment of the population should bear a disproportionate share of adverse human health or environmental effects. To address these concerns, Executive Order 12898, *Federal Actions to Address Environmental Justice in Minority and Low Income Populations* was issued. It requires each Federal agency to

Table 3: Federal Endangered, Threatened and Candidate Species Likely to Occur in the Savannah River Basin Study Area

SPECIES	SCIENTIFIC NAME	FEDERAL STATUS
MAMMALS		
Indiana Bat	*Myotis sodalis*	E*
West Indian manatee	*Trichechus manatus*	E
BIRDS		
Red cockaded woodpecker	*Picoides borealis*	E
Piping plover	*Charadrius melodus*	T
Wood stork	*Mycteria americana*	E
Kirtland's warbler	*Dendroica kirtlandii*	E
REPTILES		
Eastern indigo snake	*Drymarchon corais couperi*	T
AMPHIBIANS		
Flatwoods salamander	*Ambystoma cingulatum*	T
Fish		
Shortnose sturgeon	*Acipenser brevirostrum*	E
Atlantic sturgeon	*Acipenser oxyrinchus*	C***
PLANTS		
Canby's dropwort	*Oxypolis canbyi*	E
Chaff seed	*Schwalbea americana*	E
Schweinitz's sunflower	*Helianthus schweinitzii*	E
Small whorled pogonia	*Isotria medeoloides*	T
Pondberry	*Lindera melissifolia*	E
Rough leaved loosestrife	*Lysimachia asperulaefolia*	E
False Poison Sumac	*Rhus michauxii*	E
Bunched arrowhead	*Sagittaria fasciculata*	E
White irisette	*Sisyrinchium dichotomum*	E
Dwarf flowered heartleaf	*Hexastylis naniflora*	T
Mountain sweet pitcher plant	*Sarracenia rubra ssp. jonesii*	E
Harperella	*Ptilimnium nodosum*	E
Swamp pink	*Helonias bullata*	T
Smooth coneflower	*Echinacea laevigata*	E
Seabeach amaranth	*Amaranthus pumilus*	T
Persistent trillium	*Trillium persistens*	E
Relict trillium	*Trillium reliquum*	E
Little amphianthus	*Amphianthus pusillus*	T
Miccosukee gooseberry	*Ribes echinellum*	T
Bog asphodel	*Narthecium americanum*	C***

* Endangered

** Threatened
*** Candidate

Table 4: Georgia and South Carolina Rare, Threatened and Endangered Species Occurring in Counties Adjacent to the Savannah River

SCIENTIFIC NAME	COMMON NAME	GA STATE STATUS	SC STATE STATUS
Acipenser brevirostrum	Shortnose Sturgeon		FE[1]/SE[2]
Aimophila aestivalis	Bachman's Sparrow	R[3]	
Amblyscirtes reversa	Reversed Roadside Skipper		N3N4
Ambystoma cingulatum	Flatwoods Salamander		FT[4]/SE
Aneides aeneus	Green Salamander	R	
Autochton cellus	Golden-Banded Skipper		N4
Caretta caretta	Loggerhead		FT/ST[5]
Carex biltmoreana	Biltmore Sedge	T	
Carex manhartii	Manhart's Sedge	T	
Carex misera	Wretched Sedge	T	
Ceratiola ericoides	Rosemary	T	
Chamaecyparis thyoides	Atlantic White-Cedar	R	
Charadrius wilsonia	Wilson's Plover	R	
Clemmys guttata	Spotted Turtle	U	
Clemmys guttata	Spotted Turtle		ST
Corynorhinus rafinesquii	Rafinesque's Big-Eared Bat	R	SE
Cymophyllus fraserianus	Fraser's Sedge	T	
Cyprinella callitaenia	Bluestripe Shiner	T[6]	
Cypripedium acaule	Pink Ladyslipper	U[7]	
Cypripedium parviflorum var. Parviflorum	Small-Flowered Yellow Ladyslipper	U	
Cypripedium parviflorum var. Pubescens	Large-Flowered Yellow Ladyslipper	U	
Draba aprica	Open-Ground Whitlow-Grass	E[8]	
Echinacea laevigata	Smooth Coneflower		FE/SE
Elanoides forficatus	Swallow-Tailed Kite	R	
Elliottia racemosa	Georgia Plume	T	
Epidendrum conopseum	Green-Fly Orchid	U	
Fusconaia masoni	Atlantic Pigtoe Mussel	E	
Gopherus polyphemus	Gopher Tortoise		SE
Haematopus palliatus	American Oystercatcher	R	
Hydrastis canadensis	Goldenseal	E	
Hymenocallis coronaria	Shoals Spiderlily	E	
Isoetes tegetiformans	Mat-Forming Quillwort	E	
Isotria medeoloides	Small Whorled Pogonia		FT/ST
Lasmigona decorata	Carolina Heelsplitter		FE/SE
Lindera melissifolia	Pondberry		FE/SE
Lindernia saxicola	Rock False Pimpernel	E	
Litsea aestivalis	Pondspice	T	
Lysimachia fraseri	Fraser's Loosestrife	R	
Marshallia ramosa	Pineland Barbara Buttons	R	
Moxostoma robustum	Robust Redhorse	E	
Mycteria americana	Wood Stork		FE/SE
Myotis leibii	Eastern Small-Footed Myotis		ST
Myotis sodalis	Indiana Myotis		FE/SE

SCIENTIFIC NAME	COMMON NAME	GA STATE STATUS	SC STATE STATUS
Nestronia umbellula	Indian Olive	T	
Notropis hypsilepis	Highscale Shiner	T	
Notropis photogenis	Silver Shiner	E	
Notropis scepticus	Sandbar Shiner	R	
Oxypolis canbyi	Canby's Dropwort	E	
Oxypolis canbyi	Canby's Dropwort		FE/SE
Phenacobius crassilabrum	Fatlips Minnow	E	
Physostegia leptophylla	Tidal Marsh Obedient Plant	T	
Picoides borealis	Red-Cockaded Woodpecker		FE/SE
Plethodon websteri	Webster's Salamander		SE
Pseudobranchus striatus	Dwarf Siren		ST
Ptilimnium nodosum	Harperella		FE/SE
Quercus oglethorpensis	Oglethorpe Oak	T	
Rana capito	Gopher Frog		SE
Ribes echinellum	Miccosukee Gooseberry		FT/ST
Sanguisorba canadensis	Canada Burnet	T	
Sarracenia flava	Yellow Flytrap	U	
Sarracenia minor	Hooded Pitcherplant	U	
Sarracenia purpurea	Purple Pitcherplant	E	
Sarracenia rubra	Sweet Pitcherplant	E	
Schisandra glabra	Bay Starvine	T	
Schwalbea americana	Chaffseed		FE/SE
Scutellaria ocmulgee	Ocmulgee Skullcap	T	
Sedum pusillum	Granite Stonecrop	T	
Senecio millefolium	Blue Ridge Golden Ragwort	T	
Shortia galacifolia	Oconee Bells	E	
Speyeria diana	Diana		N3
Sterna antillarum	Least Tern		ST
Stewartia malacodendron	Silky Camellia	R	
Stylisma pickeringii var. Pickeringii	Pickering's Morning-Glory	T	
Trichechus manatus	Manatee		FE/SE
Trillium persistens	Persistent Trillium		FE/SE
Trillium reliquum	Relict Trillium		FE/SE
Waldsteinia lobata	Piedmont Barren Strawberry	T	
Xerophyllum asphodeloides	Eastern Turkeybeard	R	

Sources: Georgia EPD and South Carolina DNR

1 FE - Federal Endangered

2 SE - State Endangered (official state list-animals only)

3 R - Rare

4 FT - Federal Threatened

5 ST – State Threatened (official state list-animals only)

6 T - Threatened

7 U - Unusual (thus deserving of special consideration)

8 E – Endangered

"make the achievement of environmental justice part of its mission by identifying and addressing disproportionately high and adverse human health and environmental effects on minority and low-income populations."

2.10.2. Protection of Children

The concept of protecting children arises out of a growing body of scientific knowledge, which demonstrates that children may suffer disproportionately from environmental health and safety risks. To address these concerns, Executive Order 13045, *Protection of Children from Environmental Health Risks and Safety Risks* was issued. It requires each federal agency to identify and assess environmental health and safety risks that may disproportionately affect children; and, ensures that policies, programs, activities, and standards address disproportionate risk to children that results from environmental health or safety risks.

3.0 DESCRIPTION OF THE PROPOSED ACTION AND OTHER ALTERNATIVES

3.1. ALTERNATIVE FORMULATION

The Georgia Department of Natural Resources, Environmental Protection Division (GA DNR-EPD), South Carolina Department of Health and Environmental Control (SC DHEC) and the South Carolina Department of Natural Resources (SC DNR) developed and evaluated alternatives to address the diminishing conservation pools in the Corps' three-lake system on the Savannah River. Their proposal is included as Appendix B to this document. On October 1, 2008, GA DNR-EPD requested Savannah District consider reducing flows from its three-lake system this fall and winter (Appendix C). SC DNR submitted a similar request on October 9, 2008 (Appendix D). SC DHEC submitted a similar request on October 6, 2008 (Appendix E). The states request follows much discussion between those agencies and various stakeholders over the course of the summer of 2008. The states considered several alternatives and proposed the Corps temporarily deviate from its Drought Contingency Plan to reduce discharges to 3,100 cfs during the cooler months of October 2008 through February 2009.

3.2. ALTERNATIVES ANALYSIS

Alternatives were developed for consideration as part of the planning process and are:

a. NAA (Continue with the SRBDCP, March 1989)
b. Alternative 1 (Selected Alternative)
c. Alternatives Considered But Eliminated From Detailed Consideration

3.2.1. No Action Alternative

This Alternative consists of the Corps taking no action to modify its existing Savannah River Basin Drought Contingency Plan (SBRDCP) with its 2006 modifications. This alternative incorporates the previously-approved deviation request for 3,600 cfs minimum daily flow from Thurmond and 3,600 cfs specified daily average flow once trigger Level 3 is reached. The

operating procedures described in that 2006 SRBDCP Update would continue to be implemented and they form the basis upon which comparisons to the other alternatives can be made. Action thresholds were established in the 2006 SRBDCP Update and are based on pool elevations at Hartwell and Thurmond Lakes. Russell Lake has a relatively small conservation pool, therefore it does not have action thresholds delineated. Due to the nature of pumped storage operation, Russell Lake may vary throughout its five-foot conservation pool.

As described in the 1989 Drought Contingency Plan, the Corps would also monitor salinity levels in the estuary. During "critical water periods" Savannah District would perform roving salinity sampling at several locations in the estuary to determine and document the extent of salinity intrusion. The Savannah Basin projects have never reached Level 4 in the 16 years that the Plan has been operational.

As a result of mechanical difficulties, two pumped storage units are presently available at RBR for each alternative. Eighty unit hours of pumping per week is required to support the current hydropower contract. Pumping beyond 80 unit hours up to the maximum allowed by the Richard B. Russell Dam and Lake Project Pumped Storage Environmental Assessment of August 1999 can still occur when economically feasible.

This alternative is considered in detail and is evaluated in regard to all environmental concerns**.**

3.2.2. Alternative 1

Alternative 1 consists of temporarily modifying one feature of the approved Drought Contingency Plan. It is essentially the same as the NAA except the minimum daily average release at Thurmond Dam would be adjusted from 3,600 to 3,100 cubic feet per second (cfs) during the cooler months from November 1, 2008 through February 28, 2009. In response to requests made during the public comment period, the Corps would implement this alternative in phases, with the first phase being a reduction to 3,300 cfs for one week, followed by a further reduction to 3,100 cfs.

The States of Georgia and South Carolina have indicated they intend to monitor the results of the proposed flow reduction, should it be implemented. With the cooperation of stakeholders, the States identified specific resources that they will be examining, as well as specific monitoring parameters and general performance targets. The States are coordinating these monitoring efforts with various organizations which would perform the work. If parameters are found to exceed acceptable levels, the monitoring organization would notify the State, who would review the information, discuss the results with the other State (GA DNR-EPD, SC DHEC and SC DNR),

Table 5: Hartwell Action Levels for the NAA

LEVEL*	1 APR – 15 OCT (feet msl)	15 DEC – 1 JAN** (feet msl)	ACTION
1	656	654	Public safety information. Reduce Thurmond discharge to 4,200 cfs weekly average, reduce Hartwell discharge as appropriate to maintain balanced pools.
2	654	652	Reduce Thurmond discharge to 4,000 cfs weekly average, reduce Hartwell discharge as appropriate to maintain balanced pools.
3	646	646	Reduce Thurmond discharge to 3,800 cfs daily average, reduce Hartwell discharge as appropriate to maintain balanced pools.
4	625	625	Maintain 3,600 cfs as long as possible, thereafter transition to daily average outflow = daily average inflow

Note. A temporary deviation was authorized on October 23, 2007, allowing a minimum daily average release of 3,600 cfs at Thurmond and a specified target of 3,600 cfs at drought Level 3.

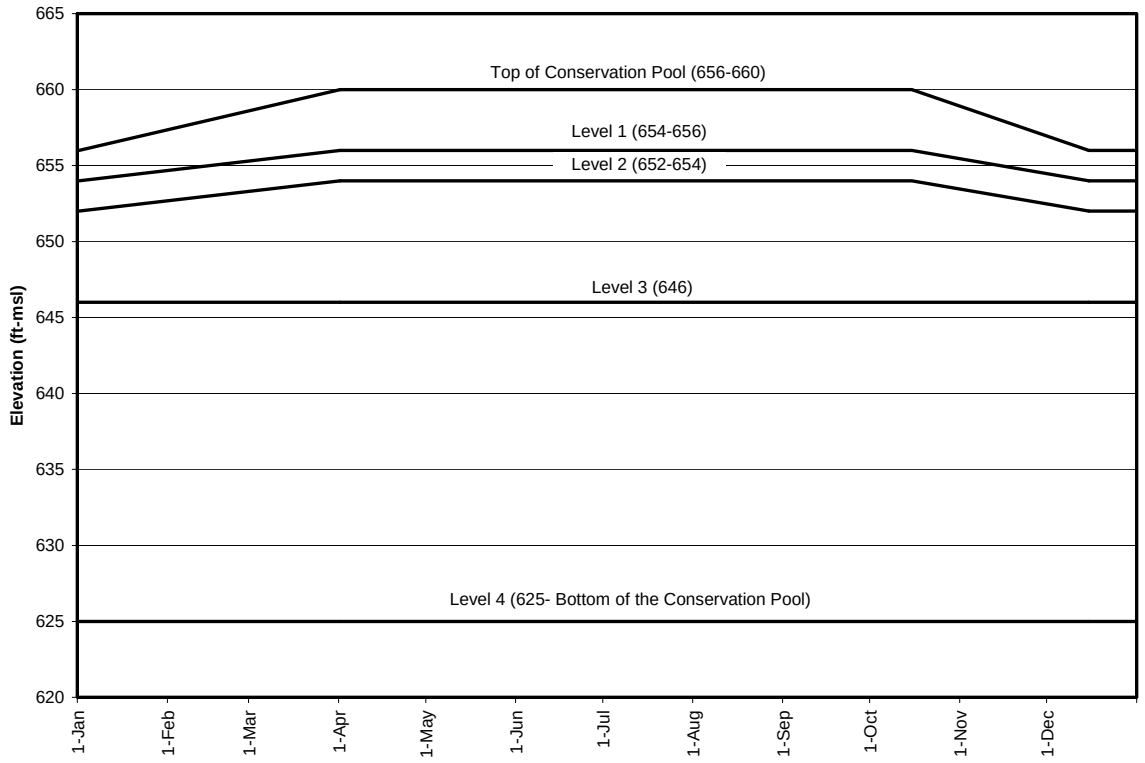


Figure 1: Hartwell Action Levels for the No Action Alternative

* Level as shown in Figure 1

** Lake elevations for the periods January 1 to April 18 and October 15 to December 1 are linearly interpolated from this data as shown in Figure 1

Table 6: J. Strom Thurmond Action Levels for the No Action Alternative

LEVEL*	1 APR – 15 OCT (FEET MSL)	15 DEC – 1 JAN** (FEET MSL)	ACTION
1	326	324	Public safety information. Reduce Thurmond discharge to 4200 cfs weekly average, reduce Hartwell discharge as appropriate to maintain balanced pools.
2	324	322	Reduce Thurmond discharge to 4000 cfs weekly average, reduce Hartwell discharge as appropriate to maintain balanced pools.
3	316	316	Reduce Thurmond discharge to 3800 cfs daily average, reduce Hartwell discharge as appropriate to maintain balanced pools.
4	312	312	Maintain 3600 cfs as long as possible, thereafter transition to daily average outflow = daily average inflow

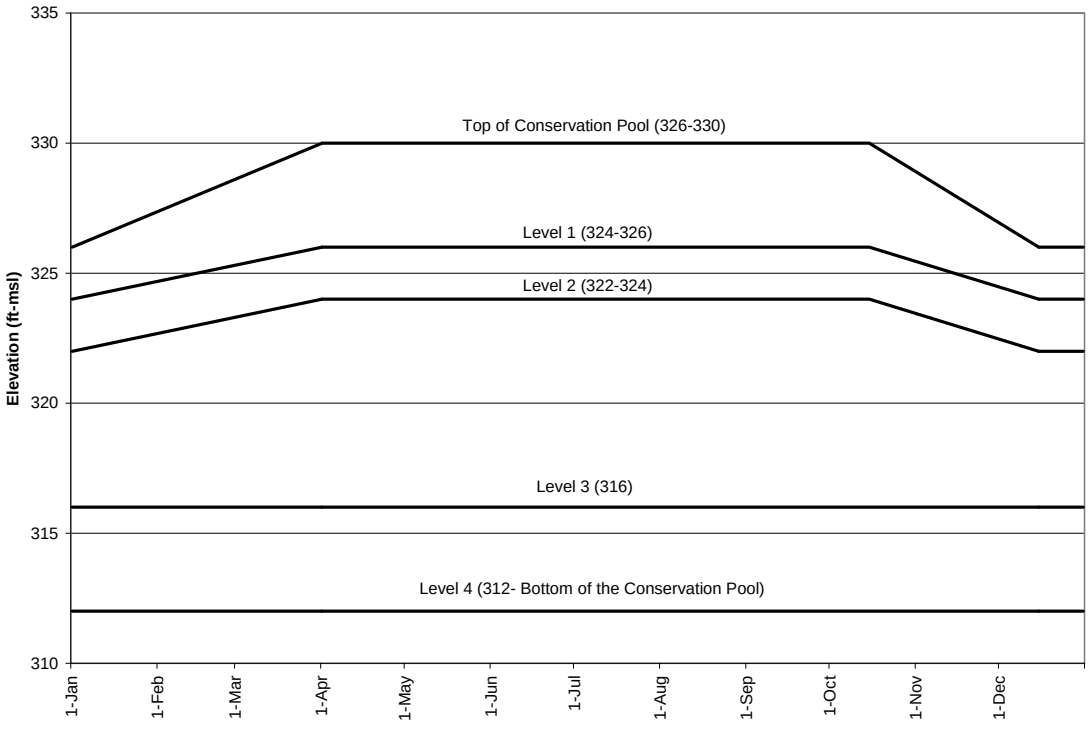


Figure 2: Thurmond Action Levels for the No Action Alternative

* Level as shown in Figure 1

** Lake elevations for the periods January 1 to April 1 and October 15 to December 1 are linearly interpolated from this data as shown in Figure 1

and then recommend to Savannah District appropriate adjustments to Thurmond release levels. The Corps would restore the water flows up to the 3,600 cfs daily average if requested by either the State of Georgia or South Carolina. NOAA-Fisheries would be involved in discussions of potential impact to spawning of Shortnose sturgeon.

Location	Target	Responsible Party
Augusta Canal	Flow < 2,900 cfs	City of Augusta
USGS 021989773 (USACE Dock)	DO > 5.0 mg/L daily average DO > 4.0 mg/L instantaneous Temperature ≤ 90 ºF pH 6-8.5	GA DNR-EPD
USGS 02198840 (I-95 Bridge)	Conductivity < 10,000 µS/cm	GA DNR-EPD
Abercorn Creek	Chloride < 16 ppm	City of Savannah
USGS 02198500 (Clyo)	Flow > 4,500 cfs	SC DHEC
Various	Water level at the intakes	Intake operators
Various	Sturgeon migration	SC DNR and NOAA Fisheries

The values shown above are general performance targets and not strict acceptability criteria. The desired targets would initiate an evaluation of impacts, which could lead to a request to the Corps to restore the discharges from Thurmond Dam to 3,600 cfs. The Corps recognizes that flows at Clyo were recently less that the target of 4,500 cfs. However, the States are aware of no water quality problems that have resulted and continue to support the proposed flow reduction.

The District expects the following offices to represent their agencies:

Agency	Office	Individual
GA DNR-EPD	Watershed Protection Branch	Jeff Larson, Assistant Branch Chief
SC DNR	Office of Environmental Programs	Bob Perry, Director
SC DHEC	Bureau of Water	David Baize, Assistant Bureau Chief
NOAA Fisheries, Southeast Regional Office	Protected Resources Division	Stephania Bolden, Fishery Biologist

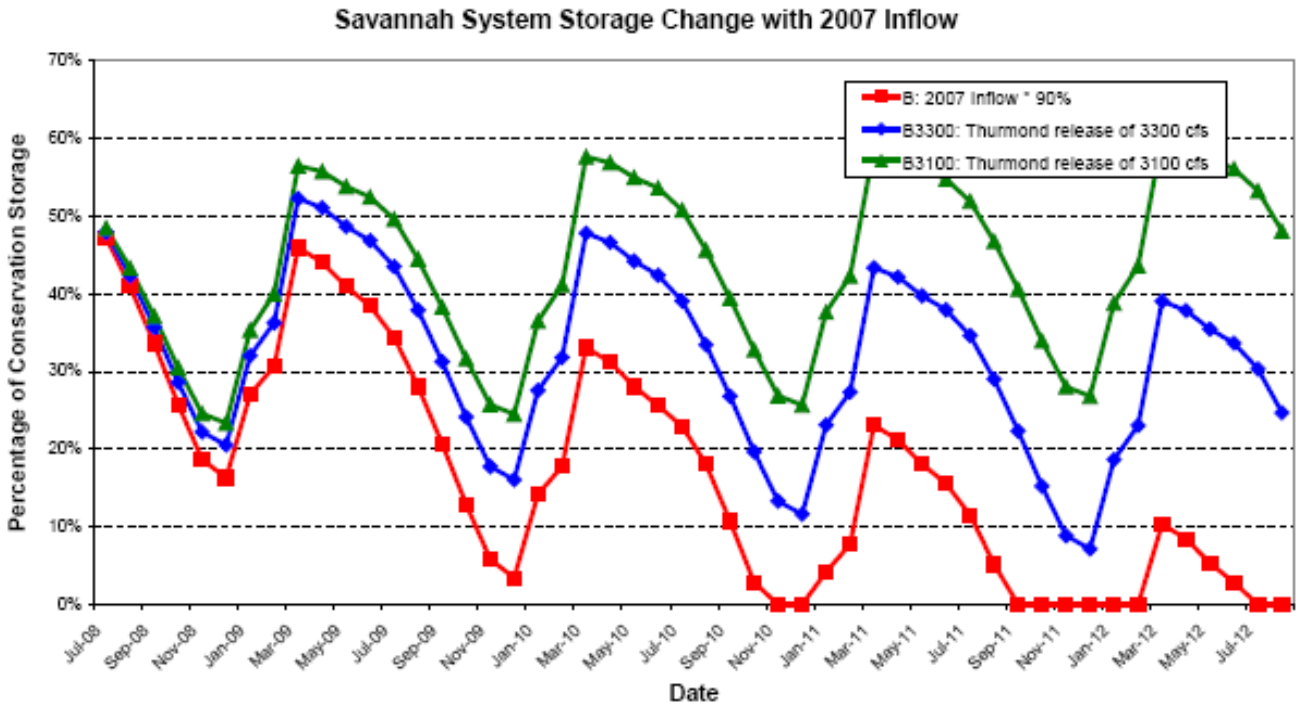
3.2.3. Alternatives Considered But Eliminated From Detailed Consideration

A preliminary alternative that was initially considered was similar to Alternative 1 with a daily average flow reduction to 3,300 cfs for the cooler months (October 1 through February 28). Under the recorded 2007 hydrology (with a 10% reduction in inflow), a release of 3,300 cfs from Thurmond Dam was found to not be enough to stabilize the reservoir system. There would still be a sharp decline of conservation storage within the 3-lake system, resulting in low system storage toward the end of 2009. Storage would recover somewhat during the winter and spring period of 2009, but would decline again and reach a new record low toward the end of 2010. Figure 3 below shows the percentage of conservation storage in the three-lake system that would remain over time with this alternative. This alternative was deemed to be unacceptable by the States and was dropped from further consideration.

3.2.4. Recommended Alternative

The Recommended Action is Alternative 1, the temporary modification of one feature of the approved Drought Contingency Plan. The minimum daily average release at Thurmond would be reduced from 3,600 cfs to 3,100 cfs in drought Level 3 for the cooler months from November 1, 2008 through February 28, 2009. The Corps would restore the water flows up to the 3,600 cfs daily average if requested by either the State of Georgia or South Carolina.

Figure 3 – Comparison of Alternatives



4.0 ENVIRONMENTAL AND SOCIO-ECONOMIC CONSEQUENCES

Savannah District does not anticipate any substantial effects to air quality, noise, non-renewable resources, mineral resources, farmland, wetlands, water quality in the lakes, or to fishery resources. We do not envision any irretrievable commitments of resources from either alternative. Savannah District believes the proposed project is consistent with both the Georgia and South Carolina Coastal Zone Management Program to the maximum extent practicable.

Flows up to 10,000-15,000 cfs, as discussed in Section 4.4, are expected to remain within the stream channel. Flows discussed in the drought alternatives range between 3,600 and 3,100 cfs, so they would be contained within the stream channels. Fluctuating these flows as discussed in Sections 4.3, 4.4 and 4.5 would produce no measurable impacts on adjacent floodplain wetlands along the river (upstream of the estuary).

4.1. WATER QUALITY

4.1.1 Overview

When discharges are reduced from Thurmond Dam, impacts could occur to downstream water quality. Lower discharges could increase water temperature and reduce the quality of the river downstream of point source discharges. The summer months are the most critical to aquatic resources, so reduced river flows during those months would cause greater adverse impacts.

The State of South Carolina uses the current drought plan Level 3 flow of 3,600 cfs (Andrew Wachob, South Carolina DNR) at the Savannah River Augusta gage for the permitting of point source discharges in the Augusta area and this flow is adjusted upward to account for tributary input as one moves down the river. The State of Georgia uses the 7Q10 flow values of 3,800 cfs at the Augusta gage, 4,160 cfs at the Millhaven gage, and 4,710 cfs at the Clyo gage in its point source discharge permit decisions. In the following analysis, the flows of the modeled alternatives were compared to the flows of the modeled No Action Alternative to determine the impacts of temporarily changing the SRBDCP.

The Georgia Department of Natural Resources, Environmental Protection Division (EPD) analyzed the potential effects on water quality from the proposed winter flow reduction. EPD evaluated the potential impacts in both the river and the estuary/harbor area. They concentrated on dissolved oxygen levels, since the States and EPA had previously identified that as a critical water quality parameter in this basin.

For the river portion (Thurmond Dam to Clyo) of the basin, GA DNR-EPD used the RIV1 Model which they use to allocate point source discharges along the river to identify potential problems if the river flow was reduced. For the estuary/harbor portion of the basin (Clyo to ocean), they used the EFDC and WASP Models that had been developed by EPA and used for EPA's TMDL analysis. The States concluded that the modeling indicated that the proposed

temporary seasonal reduction of Thurmond release would not cause water quality problems in the river or the harbor. The following paragraphs contain details of the water quality analyses:

4.1.2 Savannah River downstream of Thurmond Dam

The first model simulation was conducted with 2007 meteorological data, tributary inflows, and Thurmond release data; and 2006 wasteload discharges and water withdrawals. This simulation was developed to identify how well the model was calibrated to observed DO data. Figures 4 and 5 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 (US Highway 301) and RM 61 (Clyo Gage), 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 was calibrated relatively well.

Figure 4 - Calibration of Savannah River water quality model at River Mile 119

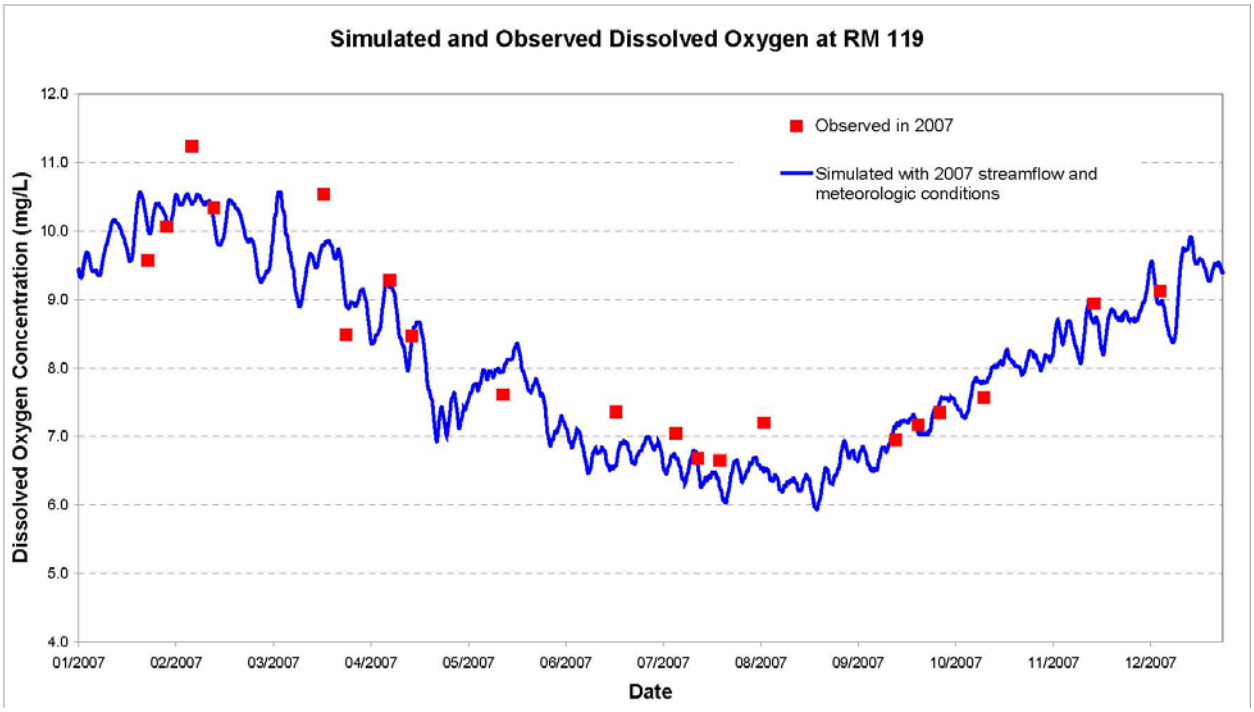
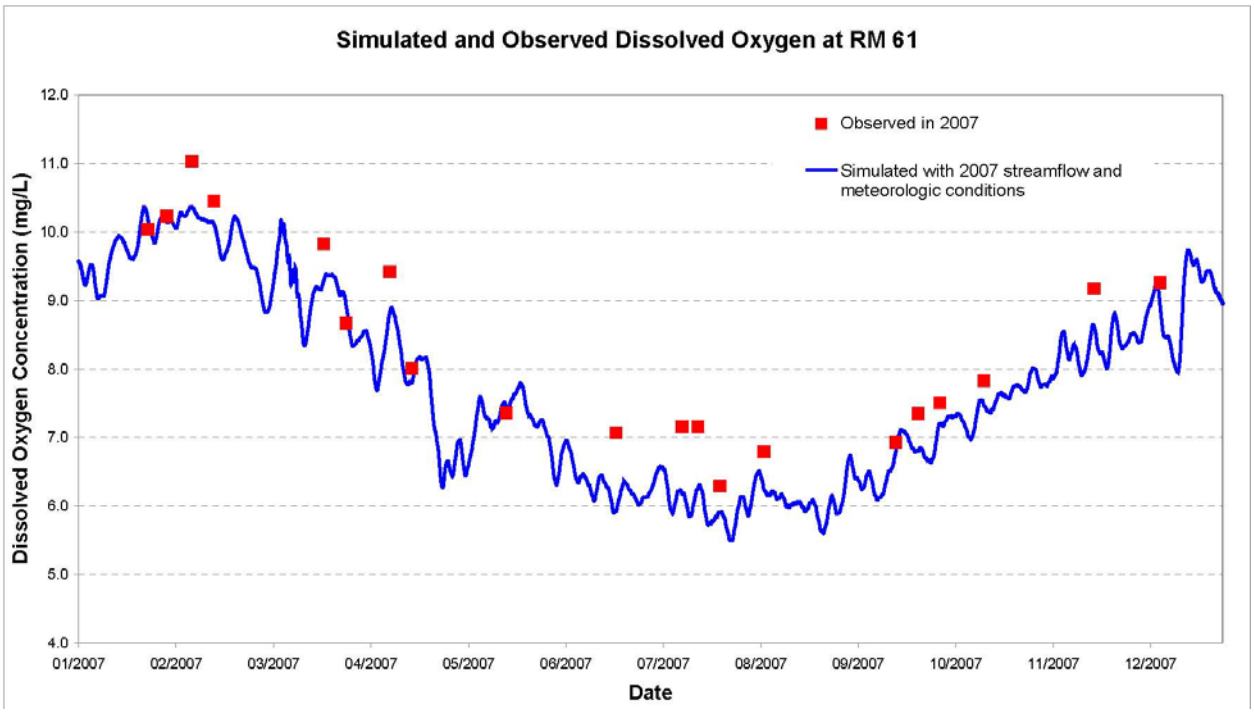


Figure 5 - Calibration of Savannah River water quality model at River Mile 61



GA DNR-EPD conducted additional model simulations using 2007 meteorological data and tributary inflows, and 2006 wasteload discharges and water withdrawals. These model simulations incorporated varying amounts of discharges from Thurmond Dam (3,600 and 3,100 cfs).

Figures 6 and 7 show the results of the 3,600 cfs simulation (No Action Alternative). Under a Thurmond release of 3,600 cfs, the simulated DO concentrations at RM 119 (US Highway 301) are predicted to be above 5 mg/L throughout the year (Fig. 6). Figure 7 shows simulated DO concentration at River Mile 61 (Clyo) under a Thurmond release of 3,600 cfs. Again, the simulated DO concentrations are predicted to be higher than 5 mg/L throughout the year. The riverine water quality model shows that the 5.0 mg/L DO standard would not be breached by a Thurmond release of 3,600 cfs.

Figure 6 – Dissolved Oxygen at RM 119

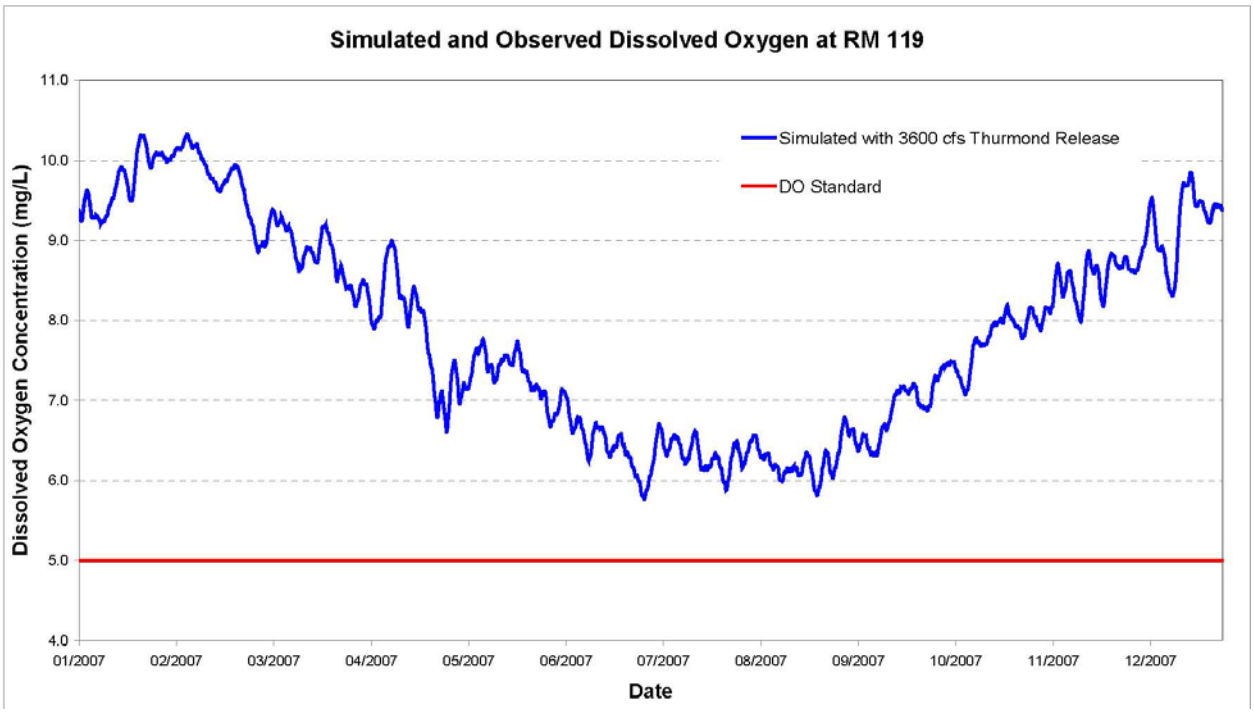
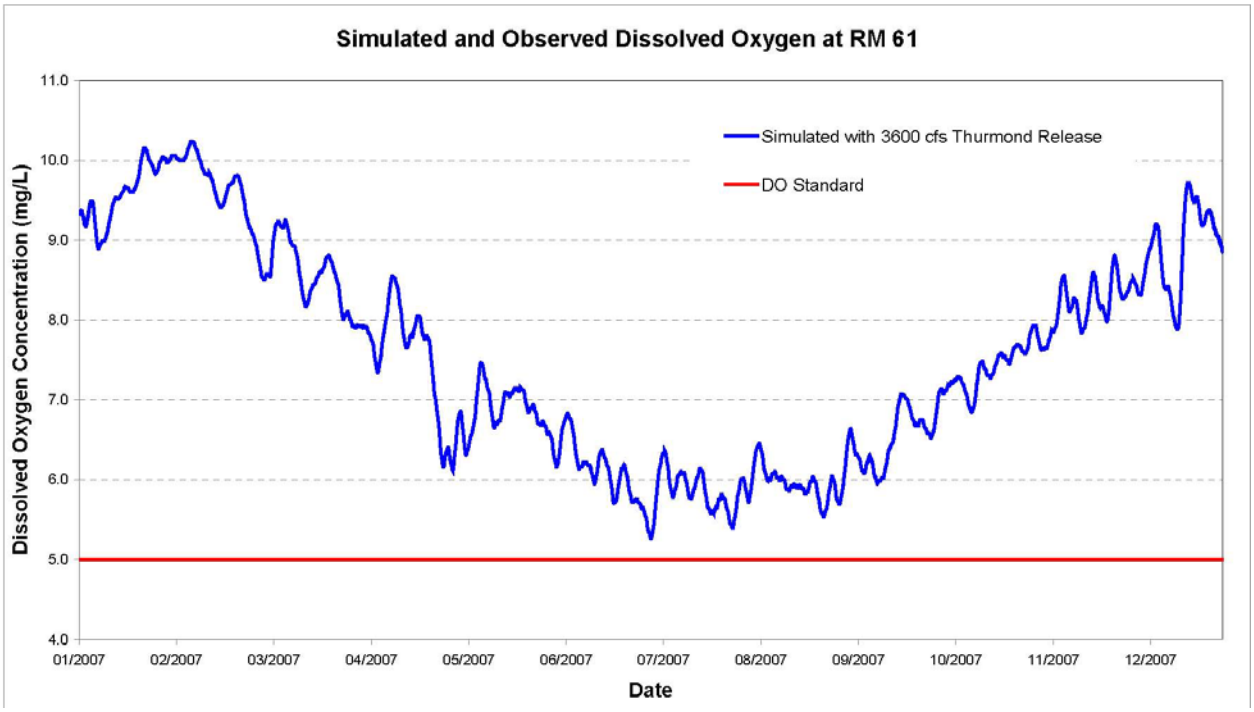


Figure 7 - Dissolved Oxygen at RM 61



Figures 8 and 9 show the simulated DO concentrations at River Mile 119 and River Mile 61 respectively, under a Thurmond release of 3,100 cfs. The model indicates that the DO would remain above the standard of 5 mg/L throughout the year. For the cooler months of October through February, DO concentrations would remain higher than 6.0 mg/L and almost always be higher than 7.0 mg/L at both River Mile 119 and River Mile 61.

Figure 8 – Simulated Dissolved Oxygen at RM 119

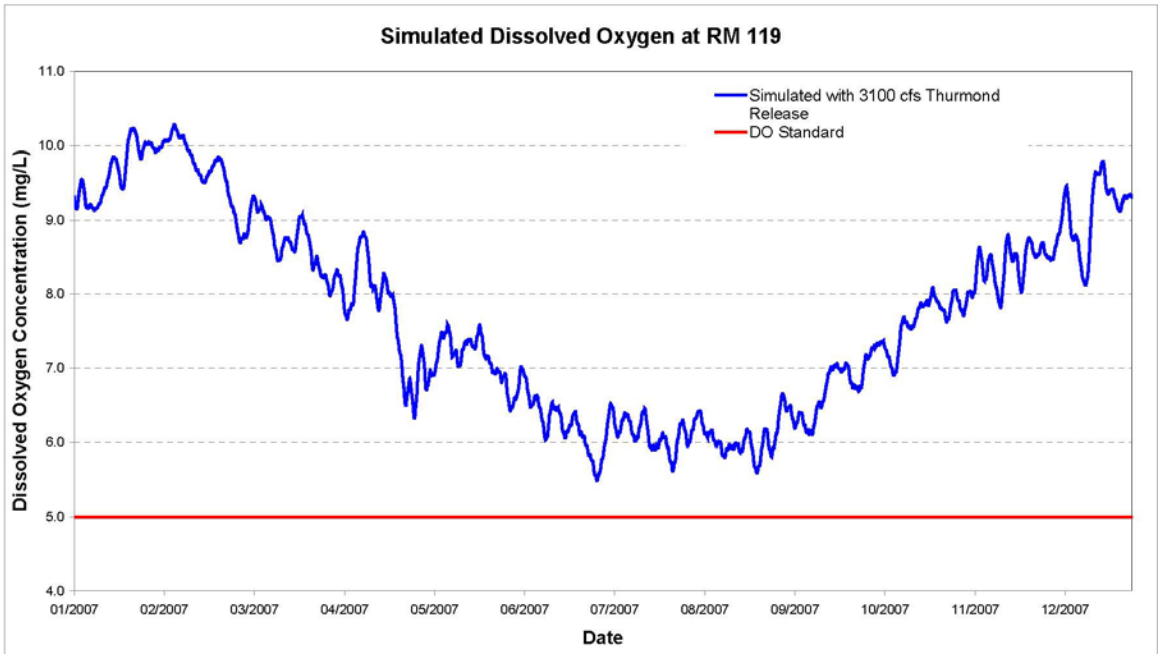
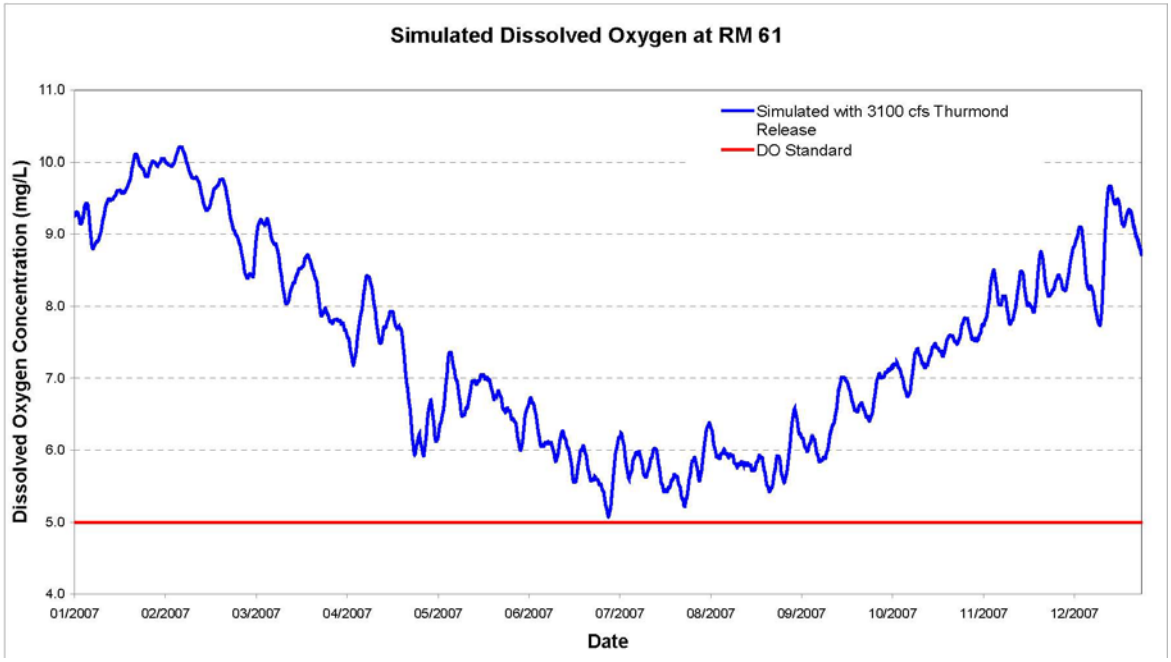


Figure 9 – Simulated Dissolved Oxygen at RM 61



One should note 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 the model may give overly pessimistic DO concentrations. Algal activity typically increase DO concentrations during the day, while algal respiration and decay of the algal biomass tend to decrease DO at night. It is likely that field data would document higher DO concentrations than the model predicts.

The proposed action includes a continuation of 3,600 cfs release from Thurmond Dam in the months of March through October and a reduced release from Thurmond Dam of 3,100 cfs in the cooler months (November 2008 through February 2009). This action would not result in any adverse change in DO concentration in the warmer months.

GA DNR-EPD indicates that monitoring stations would be set up at locations along the river to monitor changes in DO concentration along the lower reaches if the proposed operation is adopted. The Corps proposes to use adaptive management as part of the proposed action. If field observations indicate any problem with DO concentration, GA DNR-EPD or SC DHEC would notify the Corps and Savannah District would then increase flows up to a 3,600 cfs discharge to mitigate the adverse conditions.

Once the 3,100 cfs objective is reached, it would be maintained through February 28, 2009 or until such time that (1) a listed monitoring site fails to meet its environmental target, and (2) a decision is made by Savannah District, GA DNR-EPD, SC DHEC and SC DNR to modify the 3,100 cfs discharge. If such an event were to occur, the Corps would increase discharges from Thurmond incrementally by 100 cfs/week until the impact is alleviated or 3,600 cfs is reached.

4.1.2 Savannah Harbor

Two potential water quality related effects in the estuary were evaluated from reduced discharges from Thurmond Dam. 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 and industrial water intake is located on Abercorn Creek, upstream of the harbor near river mile 29, approximately two miles from the Savannah River. The City of Savannah is concerned about distributing water to its industrial customers when chloride concentrations in Abercorn Creek are greater than roughly 12 milligrams per liter (mg/L). Such concentrations have been shown to cause scaling in boilers.

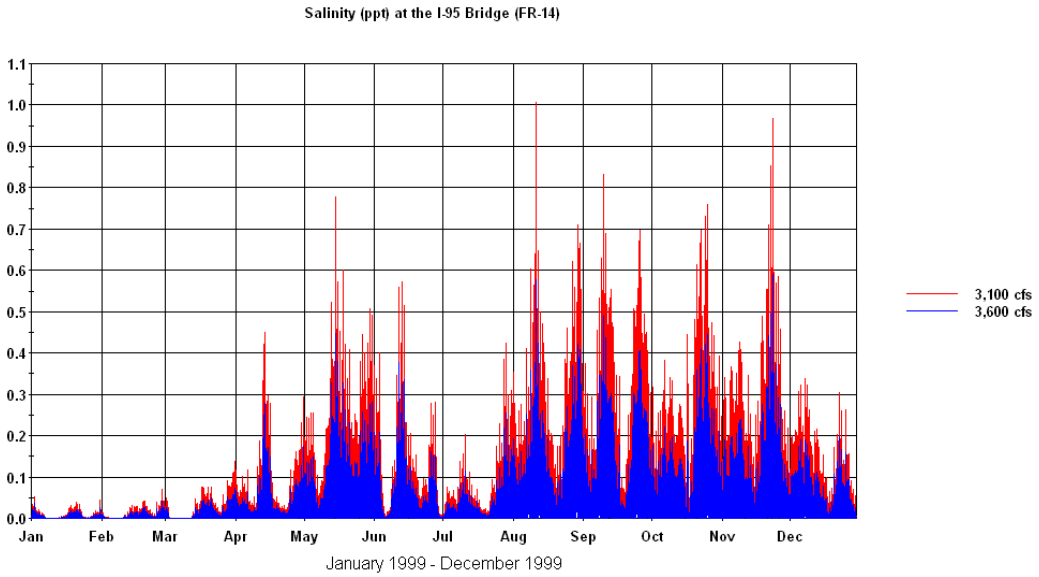
Sources of chloride in Abercorn Creek include upstream inflows from the Savannah River and salinity intrusion from the downstream Savannah Harbor. Studies have shown a good relationship between river flows at the U.S. Geological Survey's Clyo stream gage location and chloride concentrations. Results have shown that the Savannah River contains approximately 10 mg/L of chloride during low flows and 4 mg/L during high flows, when there is greater dilution. Therefore, it is during low flow periods where river chloride concentrations are as high as 10

mg/L when salinity intrusion from downstream can add additional chlorides in the vicinity of the intake and cause the water to 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.

Reducing releases from Thurmond Reservoir, by itself, would not create higher chloride concentrations at the City of Savannah's water withdrawal. Rather, it is the combination of low releases from Thurmond Reservoir, low runoff from the downstream watershed, and high (spring) tides that create a condition for elevated chloride concentrations at the City's withdrawal. With sufficient downstream inflows and normal tidal conditions, chloride levels at the City's intakes should remain unchanged. However, given the sensitivity of the City's intake to chloride concentrations greater than 12 mg/L, the proposed reservoir operation (Alternative 1) combined with low downstream inflows could increase the number and magnitude of chloride concentrations greater than 12 mg/L at the City of Savannah's M&I water withdrawal. The City of Savannah monitors chloride concentrations each day of the water they are withdrawing from Abercorn Creek. If they identify unusual values after implementation of the proposed action, they would notify the Corps and GA DNR-EPD. If the observations by the City of Savannah indicate any problem with chloride concentrations, GA DNR-EPD would recommend an appropriate action to Savannah District, possibly including the resumption of the 3,600 cfs discharge.

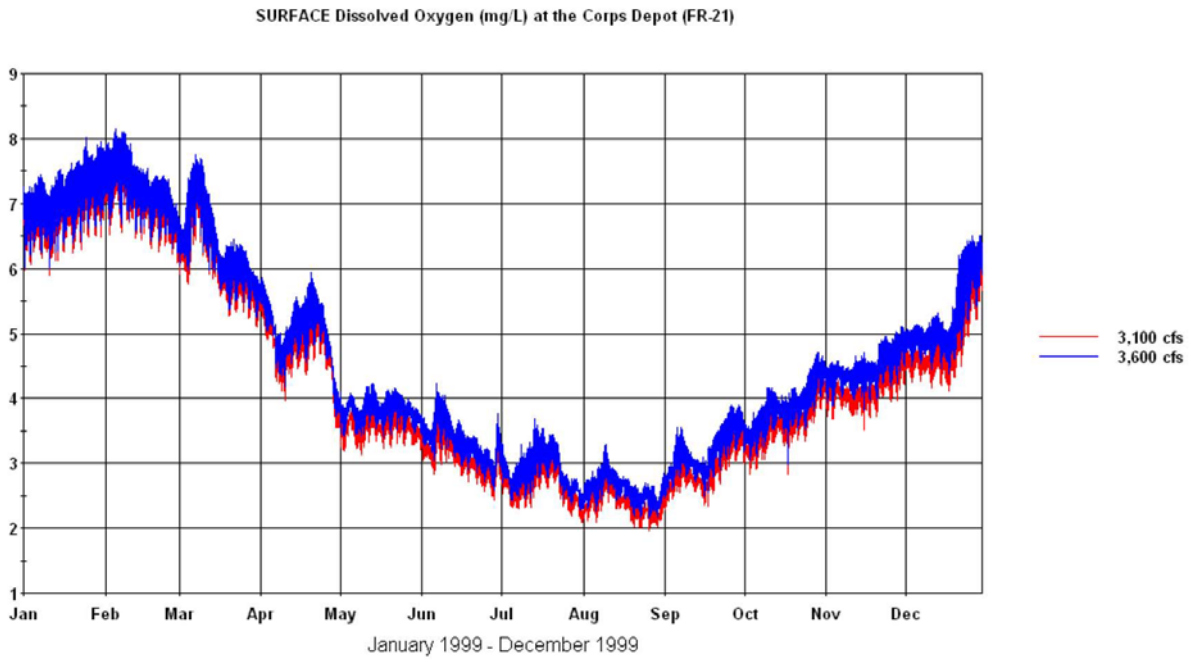
As part of the consideration of impacts to chloride levels at the City's intake, GA DNR-EPD used the Savannah Harbor EFDC Model to identify expected changes in salinity levels at the upper end of the harbor. Figure 11 shows the effects on salinity levels at the Interstate 95 Bridge, located at river mile 27.8. The results indicate that salinity should remain below 1 ppm at the I-95 Bridge during the winter months, even with the proposed reduction in discharge to 3,100 cfs.

Figure 10 – Salinity at I-95 Bridge



GA DNR-EPD evaluated the effect of the proposed Thurmond reservoir operation on dissolved oxygen concentrations in Savannah Harbor using the Savannah Harbor EFDC and WASP Models. The RIV1 Model streamflow and water quality results provided input for the upstream boundary of the harbor models. GA DNR-EPD evaluated model results and the effects on dissolved oxygen concentrations at the USGS monitoring station located at the U.S. Army Corps of Engineers' dock on Hutchinson Island in the harbor. EPD compared the results 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 10. GA DNR-EPD concluded that the modeling indicates that the proposed seasonal reduction of Thurmond releases would not result in substantial adverse impacts to dissolved oxygen levels in the harbor. Therefore, no substantial effects would be expected to EPA's TMDL for dissolved oxygen in the harbor.

Figure 11 – Simulated Surface Dissolved Oxygen in Savannah Harbor



Once the 3,100 cfs objective is reached, it would be maintained through February 28, 2009 or until such time that (1) a listed monitoring site fails to meet its environmental target, and (2) a decision is made by Savannah District, GA DNR-EPD, SC DHEC and SC DNR to modify the 3,100 cfs discharge. If such an event were to occur, the Corps would increase discharges from Thurmond incrementally by 100 cfs/week until the impact is alleviated or 3,600 cfs is reached.

4.1.3 Effects on EPA TMDLs

At EPA's request, the Corps reviewed the TMDL's that EPA previously issued for Dissolved Oxygen, Mercury, Fecal Coliform and Lead on the Savannah River.

The potential effects on dissolved oxygen were discussed in the previous section on impacts in the estuary.

The 2000 TMDL for Fecal Coliform indicates that the 23-mile river segment that is impaired is located directly downstream of the City of Augusta's wastewater treatment plant, between the Butler Creek and McBean Creek. The City of Augusta had improved their stormwater conveyance system and separated their stormwater and sanitary sewer systems. Those improvements led to dramatic decreases in fecal coliform loading to the Savannah River. The TMDL evaluated three different river flow conditions. However, the TMDL of 1.37 x 1013 Counts/day was established using the minimum daily average flow of 2,810 cfs. That flow would be exceeded under both the No Action Alternative and Alternative 1, so the TMDL for Fecal Coliform would not be affected by either alternative that is under consideration.

The 1999 TMDL for Lead indicates that the impaired 53-mile river segment is located between Brier Creek and Ebenezer Creek. The TMDL could not identify any sources of lead within the watershed. It stated that the latest sampling did not identify any lead in that segment of the river. The lower river flows with Alternative 1 could increase the concentration of lead in the water, if any is still present. Since there is uncertainty in whether lead is still present, the Corps believes that the 4-month reduction in flow by 500 cfs (14%) would not significantly affect the long term ability of the segment to meet the water quality standard of 0.54 ug/l of lead.

EPA issued a TMDL for Lead in 2000 for the 23-mile segment directly downstream of the City of Augusta's wastewater treatment plant, between the confluence of Butler and McBean Creek. Again, the TMDL could not identify any sources of lead within the watershed. The TMDL assumed that there was a legacy load of lead either in contaminated sediments or nonpoint source runoff. For this river segment, the TMDL used the critical low flow of 2,810 cfs. That flow would be exceeded under both the No Action Alternative and Alternative 1, so the TMDL for Lead in this river segment would not be affected by either alternative that is under consideration.

4.2. BIOTIC COMMUNITIES-LAKES

4.2.1. Largemouth Bass Spawning

State natural resource agencies have identified largemouth bass spawning at the three Corps Savannah River lakes as being a priority in water management decisions. The spawning period is defined as beginning when water temperatures reach 65 degrees Fahrenheit and lasts until three weeks after water

Largemouth bass

temperatures reach 70 degrees. The water temperatures are taken each day throughout this period in a sunny cove between 1000 and 1630 hours by submersing a thermometer six inches where the water is approximately three to five feet deep. The spawning period usually starts around the first of April and lasts 4 to 6 weeks (Lake Regulation and Coordination for Fish Management Purposes, South Atlantic Division, US Army Corps of Engineers, March 30, 2001).

Past studies indicate that the 4-week period of April 1-28 is the peak spawning period. Stable lake levels should be provided during this peak spawning period to prevent the stranding of eggs and abandonment of nests. Throughout the spawning season, water levels should not be lowered more than six inches below the highest lake elevation recorded during the operational spawning window. If inflows during the spawning season cause lake levels to rise to flood levels, managers have the authority to lower lake levels more than 6 inches, since flood control takes precedence over fish spawn. Maintaining these stable lake levels may not be possible during drought.

In both the NAA and Alternative 1, stable lake levels would be provided during this peak spawning period as much as possible. The difference between the two alternatives is that the lakes would be somewhat higher if Alternative 1 is implemented, since they would have retained more water during the winter months. The NAA would result in less stable pool levels, thus having a higher potential to impact fish spawning. Alternative 1 would provide more flexibility to water managers, resulting in a greater potential to manage continued drought flows without adversely impacting the 2009 spawning season.

4.2.2. Aquatic Plants

Effects of the NAA

The NAA would have no adverse impacts on aquatic plants (including invasive species, such as hydrilla) as the existing SRBDCP of March 1989 with pumped storage operation would continue to be used.

Effects of Recommended Alternative

The prolonged drought from mid-1998 through the summer of 2002 significantly reduced the abundance of aquatic vegetation in JST Lake (including invasive species, such as hydrilla) (Aquatic Plant Management Plan, US Army Corps of Engineers, Savannah District, Calendar Year 2006 Update), which is the only lake of the three with an active aquatic vegetation treatment program. Therefore, the proposed action and the associated small variations in lake levels when compared to the NAA are expected to have no adverse impact on aquatic plants in the lakes. No downstream effects are anticipated to occur within the main channel. Potential effects to aquatic plants in the shoals, estuary, and flood plain are discussed in the following sections.

4.3. BIOTIC COMMUNITIES-SHOALS

Past studies and coordination have listed shad, robust redhorse, Atlantic sturgeon, the shoals spider lily (*Hymenocalis coronaria*) and juvenile out-migration as being high priorities for the Shoals during dry years. The Shoals are

Shoals

defined as the 7.2 kilometer stream segment that is upstream of Augusta and downstream of the Augusta Canal Diversion Dam. High priority fish species benefit from higher flows across the shoals from January to May, since such flows support seasonal spawning and passage. The state-listed endangered Shoals spider lily benefit from higher flows from June to December, as such flows would provide protection from deer grazing. Undefined very high flows could be detrimental to the Shoals spider lily, but these are not expected during times of drought and are not considered here.

The flow regime in the Augusta Shoals is controlled by flow releases from Thurmond Dam, reregulation of flows at Stevens Creek Dam, and the diversion of water into the Augusta Canal by the City of Augusta at the Augusta Diversion Dam. USGS data indicates that in 2008 when discharges from Thurmond were at 3,600 cfs, the City maintained the canal gates at levels that resulted in an average of 3,150 cfs passing down the Canal and 450 cfs passing over the Shoals.

Augusta has a pending license application with the Federal Energy Regulatory Commission (FERC) which has not been formally approved by the Augusta-Richmond County Commission, pending resolution of appeals with regard to the Georgia Section 401 water quality certification. A Settlement Agreement concerning the split of water between the Augusta Canal and the Shoals was negotiated as part of the processing of the FERC license. That Agreement has not yet been finalized.

Effects of the NAA

Selection of the NAA and continuing with the existing SRBDCP with coordinated additions would have acceptable effects on these biotic communities.

Effects of Recommended Alternative

In a letter dated October 22, 2008, the City of Augusta notified the Corps that they commit "to the methodology set forth in the proposed Settlement Agreement for determining the Aquatic Base Flow and reserving for the Shoals those amounts set forth in Section 4.3 of the Settlement Agreement for the respective periods and tiers set forth therein." That section contains the following information:

4.3 Agreed Aquatic Base Flows:

	FEB/MAR	APR	MAY 1-15	MAY 16-31	JUNE- JAN
Tier 1 ≥5400	3300	3300	2500	1900	1900
Tier 2 4500-5399	2300	2200	1800	1800	1500
Tier 3 3600-4499	2000	2000	1500	1500	1500
Tier 4 <3600	1800	1800	1500	1500	1500

Although the City is not required to implement the provisions of the yet-to-be finalized Settlement Agreement, it states that it 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." 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. The Corps believes that a 50/50 split in the 500 cfs flow reduction is probably a good assumption for prediction of future impacts. Under that scenario, the Shoals would experience a 250 cfs reduction in flow from what they presently receive with the 3,600 cfs average daily discharge from Thurmond Dam. This amount of flow reduction is expected to result in minor effects to those biotic communities.

The flow reduction would occur between November 1, 2008 and February 28, 2009. The decrease in flows would occur during the cooler months, so no impacts to seasonal fish spawning or upstream fish passage are expected. Low flow conditions in the Shoals could harm resident fishes by inhibiting movement, reducing cover, and foraging habitat. The present low flows have caused some fish to leave the Shoals to locations that provide more water depth. Fish are more susceptible to stranding and predation under low flow conditions. Anadromous species, including out-migrating juveniles, are unlikely to be within the Shoals during the time of the proposed flow reduction. The decrease in flows could increase the susceptibility of Shoals spider lily to grazing by deer. Atlantic pigtoe could also be impacted by insufficient water depth, exposure and increased predation. However, it is not anticipated that the reduction of flow from 3,600 to 3,100 cfs would result in significant long term adverse effects to this species.

Once the 3,100 cfs objective is reached, it would be maintained until February 28, 2009 or until such time that (1) a listed monitoring site fails to meet its general environmental target, (2) water quality or sturgeon spawning appear to be adversely impacted, and (3) a decision is made by the Corps, GA DNR-EPD, SC DHEC, SC DNR or NOAA-Fisheries to modify the 3,100 cfs discharge. If such an event were to occur, discharges from Thurmond would be incrementally increased by 100 cfs/week until the impact is alleviated or 3,600 cfs is reached.

4.4. BIOTIC COMMUNITIES-FLOODPLAIN


Floodplain

The floodplain reach is defined as beginning downstream of the Augusta Shoals and extending to Ebenezer Landing (approximate river kilometer 65). Seedling establishment is a high priority for the floodplain reach during dry years. The establishment of seedlings is promoted by low flows (3,000 cfs or less was recommended in the 2003 workshop to occur every 10 to 20 years and not last longer than 3 years) between April and October for 3 consecutive years. However, flows up to an estimated 10,000 to 15,000 cfs remain within the stream channel at nearly all locations (15,000 cfs near the Millhaven Gage) and would not be expected to affect the floodplain.

Flows from both the No Action Alternative and Alternative 1 are expected to remain within the channel banks during the winter months. Neither plan would affect the establishment of seedlings in the floodplain. Therefore, there would be no difference between the two alternatives on potential impacts to this resource.

Modeling indicates that river levels will be reduced by approximately 6-inches downstream of Thurmond Dam. It is possible that this reduction will have a localized effect to mussel populations and other non-motile species that may be found in shallow sloughs and cutoff bends along the river. Many of these areas are already separated from the main river due to present low flow conditions, and will see no additional impact from the reduction. However, areas still connected by shallow cuts may be affected by the additional flow reduction. These areas comprise a small percentage of the overall river system. Therefore, impacts to these areas will not result in a significant impact to the river system. The Corps understands that some monitoring is being conducted of those oxbows to identify effects of the proposed flow reduction.

No other effects were identified to flood plain communities.

4.5. BIOTIC COMMUNITIES-ESTUARY


Estuary

The report from the April 1-3, 2003 workshop listed freshwater marsh habitat and the salinity gradient as being the high priorities for the estuary reach during dry years. The estuary has been defined as extending from Ebenezer Landing (approximate river kilometer 65) down to the mouth of the river. Historically, 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). Higher flows throughout the year would provide a healthier freshwater marsh plant community and allow more fish access. The estuary provides habitat for some species of fish for which Management Plans have been prepared by the South Atlantic Fishery Management Council. The managed species that could be affected by the proposed action include oyster, white shrimp, brown shrimp, and red drum. Other habitats that could be affected consist of saltmarsh, brackish marsh, oyster reefs, shell banks, tidal flats and freshwater wetlands.

The Atlantic States Marine Fisheries Commission (ASMFC) has Management Plans for river herrings and American shad, Atlantic sturgeon, and American eel. Shortnose sturgeon are managed under a recovery plan by the National Marine Fishery Service (NMFS). GA DNR-WRD and SC DNR have a Striped Bass Management Plan for the Lower Savannah River. Alewife and hickory shad are other managed species for which Management Plans have not been prepared that commonly occur in the Savannah River or its estuary.

The Savannah National Wildlife Refuge contains both tidal wetlands and managed wetland impoundments. The Refuge was established in the 1927 to provide waterfowl habitat. Since then, it has broadened its mission to the following:

- To provide habitat and sanctuary for migratory birds consistent with the objectives of the Atlantic Flyway.
- To provide habitat and protection for plants and animals whose survival is threatened or endangered.
- To use Refuge property as "a refuge and breeding ground for native birds and wild animals".
- To maintain and enhance the habitats of all other species of indigenous wildlife and fishery resources.

The Refuge manages its impoundments as “managed wetlands”. These lands are diked and the habitats within the diked areas are managed for migratory birds, including wintering waterfowl. The USFWS uses prescribed burning and water level control to increase vegetation that provides food for migrating ducks, as well as suppress vegetation that is of less value to waterfowl. According to the USFWS, the moist soil management practices that are used in most of the management units on the Refuge produce the most productive waterfowl habitat. Fresh water is provided to the managed wetlands through a supply canal located off of Little Back River (about river mile 24). On the Savannah NWR, the managed wetlands provide the most heavily used habitat for wintering waterfowl and wading birds. Based on mid-winter waterfowl surveys from 1990-2002, the Refuge provided habitat for 23 percent of the waterfowl in South Carolina.

Freshwater management (salinity < 0.5 ppt) is necessary to maintain maximum waterfowl habitat use of the Refuge’s managed wetlands. Studies have concluded that freshwater coastal impoundments in SC produce a greater variety of marsh plants, many of which are desirable waterfowl food, than brackish impoundments. Therefore, continued provision of fresh water at the supply canal is important to the Refuge’s ability to maximize its ability to provide quality waterfowl habitats.

Private lands located oceanward of the Refuge also use moist soil management to provide waterfowl habitats within their impoundments. They obtain fresh water to flood those lands from the same supply canal which serves the Savannah NWR.

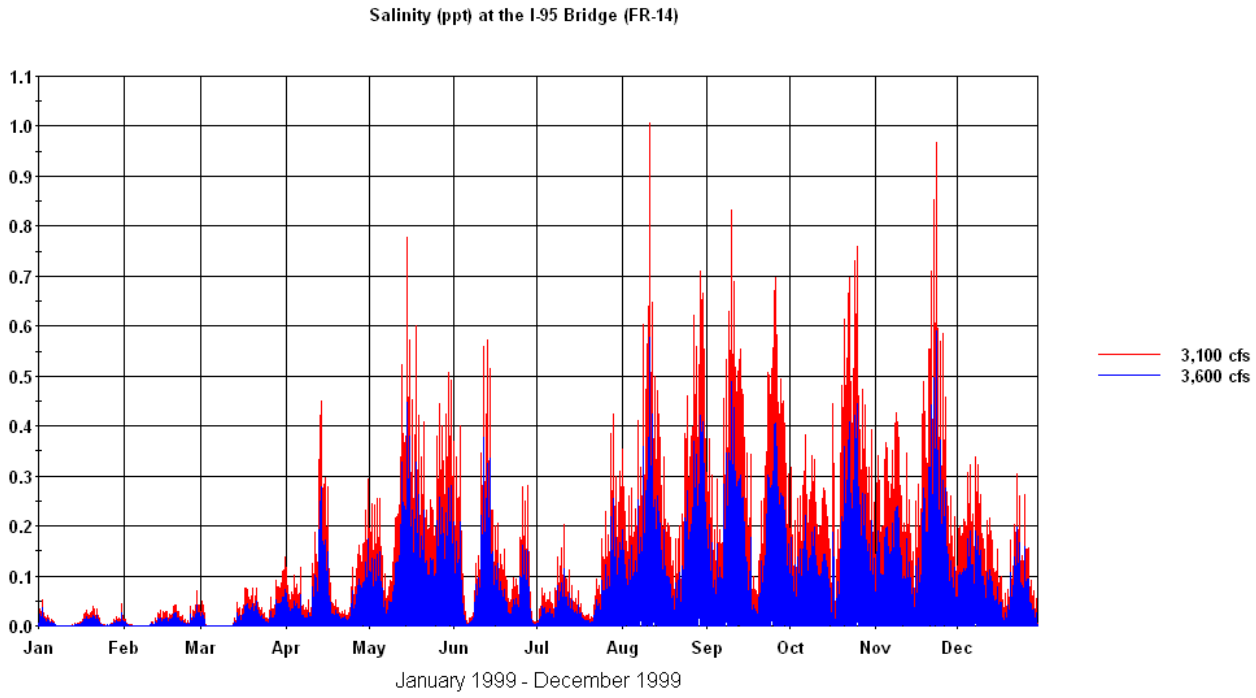
Effects of the NAA

Selection of the NAA and continuing with the existing SRBDCP would have acceptable impacts on these biotic communities for the near term. Long-term impacts are uncertain. Should the drought persist, Level 4 of the DCP could adversely affect the communities in this area. Under the NAA conditions, the freshwater / salt water interface is located downstream of the supply canal which feeds the Savannah NWR impoundments. Therefore, the Refuge and the downstream private lands would be able to provide fresh water to their managed impoundments.

Effects of Recommended Alternative

Modeling conducted by GA DNR-EPD suggests that salinity differences of less than 1 ppt would occur at the I-95 Bridge. This is shown in Figure 12 on the following page. That amount is generally within the natural variation seen in the estuary.

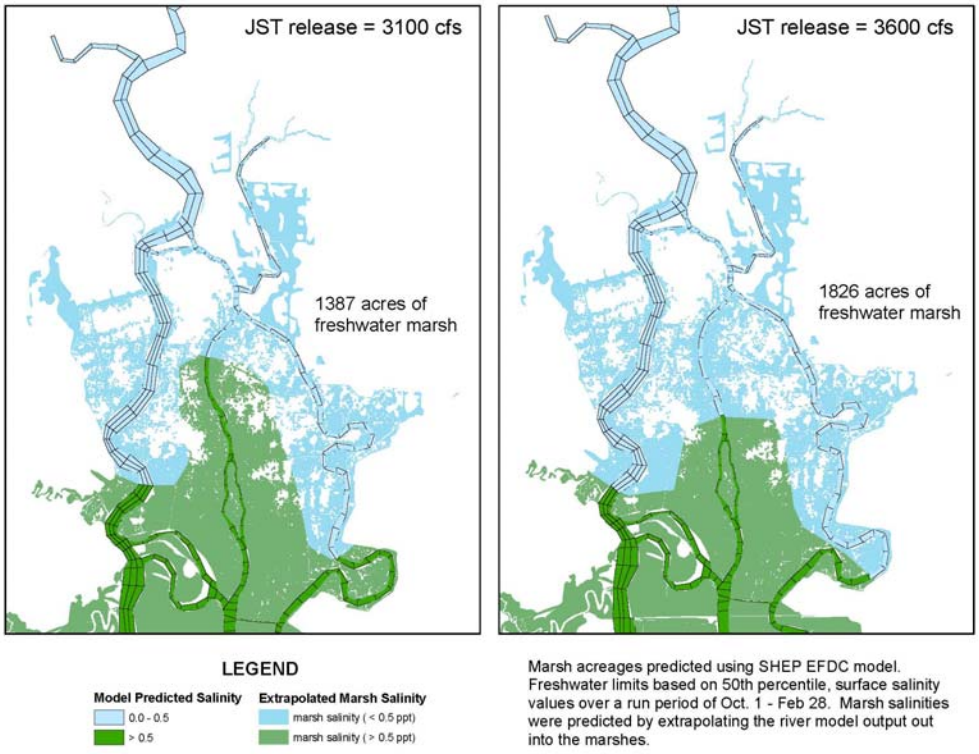
Figure 12 – Salinity Modeling at I-95 Bridge



Savannah District used the Savannah Harbor EFDC model to evaluate the potential impact of salinity changes on freshwater wetlands in the estuary. The techniques followed by the District were similar to, but a slight variation from those used to evaluate potential impacts from the proposed Savanna Harbor Expansion Project. In the SH Expansion Project, the natural resource agencies had stated that the location of the 0.5 ppt surface contour across the marsh during the summer growing season was critical to determining the species composition in the estuary. In the present evaluation, the District used the surface salinity levels that would occur during the winter months, since those are the only ones that would change as a result of Alternative 1. With that difference in technique being understood, the analysis indicates that 439 acres of freshwater marsh could undergo temporary adverse effects due to higher salinity as a result of Alternative 1. This is shown in Figure 13 on the following page. The direct effect would be short-term, as salinity levels would be restored in the spring when flows are increased to 3,600 cfs or when normal rainfall and river flows are experienced.

To place the 439 acres in context, the same analysis technique predicts that 4,072 acres of freshwater marsh would exist under average river flows (1997 flows). The results would indicate that the existing drought has already caused the temporary conversion of 2,246 acres (4,072-1,826 acres) of freshwater marsh to brackish marsh. The Corps' previous analyses indicate that a typical, but severe drought (20-year recurrence interval) would have resulted in the existence of 2,208 acres of freshwater marsh. This drought-of-record has allowed salinity to move further into the estuary than a drought with a 20-year recurrence period, temporarily reducing the acreage of freshwater marsh.

Figure 13 – Surface Salinity Modeling in the Estuary

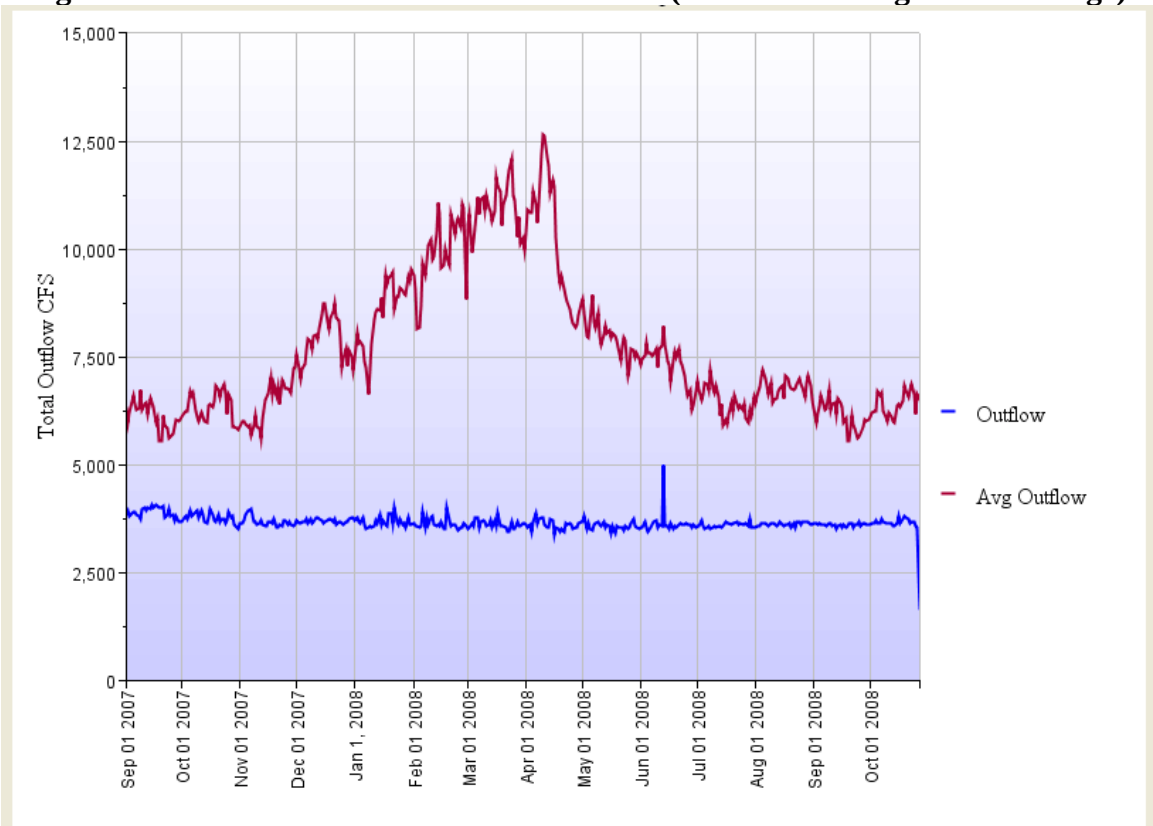


The 439-acre impact likely overstates the changes in marsh vegetation, since the reduced flows and the resulting additional salinity would occur during the winter months, which is not the primary growth season for the plants. Under those conditions, the extent of the conversion of one marsh plant species to another at a site is uncertain.

The District also used the US Geological Survey (USGS) decision support system Model-to-Marsh (M2M) to evaluate the potential impacts to tidal marsh in the estuary. This tool was developed by USGS in cooperation with the Georgia Ports Authority to simulate "the water level and salinity of the rivers and tidal marshes in the vicinity of the Savannah National Wildlife Refuge" (Conrads, 2006). Details of the model development and application can be found in the USGS Scientific Investigations Report 2006–5187 titled "*Simulation of water levels and salinity in the rivers and tidal marshes in the vicinity of the Savannah National Wildlife Refuge, Coastal South Carolina and Georgia*."

The District specified a hydrograph for consideration in the model. The hydrograph was developed based on observed flow data recorded at USGS gage station 02198500 near Clyo, GA for the period from September 1, 2007 through October 27, 2008. Over this time period, releases from Thurmond Dam were targeted at 3,600 cfs. The actual daily average discharge for the period was 3,672 cfs. Maximums and minimums for the period are 5,018 cfs and 1,688 cfs, respectively. Figure 14 shows a graphical depiction of the actual discharge from the dam (plotted in blue) and long term average discharges (plotted in burgundy).

Figure 14 – J. Strom Thurmond Dam Releases (Actual and Long Term Average)



The average monthly observed freshwater flow data coming into the estuary, determined from USGS gage data (Station 02198500) recorded near Clyo, GA for this period is shown in Table 7 on the following page. This dataset represents freshwater flows during target release from Thurmond Dam of 3,600 cfs. To predict the freshwater flows into the estuary under Alternative 1, 500 cfs was subtracted from the flow data observed under releases of 3,600 cfs. These modifications were made only during the period of October through February. At other times of the year flows near Clyo would be the same as the existing 3,600 cfs releases.

Table 7 – Freshwater Flows near Clyo, GA (USGS 02198500), Observed & Predicted

Year	Month	Average Flow (cfs) (JST = 3,600 cfs)	Predicted Flow (cfs) (JST = 3,100 cfs)*
2007	September	5207	5207
	October	4767	**4267**
	November	4574	**4074**
	December	5161	**4661**
2008	January	6827	**6327**
	February	7009	**6509**
	March	7610	7610
	April	6841	6841
	May	5352	5352
	June	4790	4790
	July	4340	4340
	August	4450	4450
	September	4530	4530
	October	4577	4577

** Flows shown in bold have been modified to predict flows during target releases of 3,100 cfs. All other flows remain unchanged.*

The M2M model was run using each of the datasets outlined in the previous section to determine impacts to the tidal marshes with implementation of the proposed action. Graphical results of the output generated are shown in Figures 15 and 16. The M2M Visualization Tool was used to develop the graphic. Yellow represents tidal marsh with pore water salinities greater than 0.5 ppt and the black and green areas represent tidal marsh pore water salinities less than 0.5 ppt. Other colors represent the river, ponds, uplands, and gaging stations.

Under both the NAA and Alternative 1, the majority of the marshes have pore water salinities greater than 0.5 ppt. Front and Middle River would have almost no freshwater marshes adjacent to the waterway, while the upper portion of Back River and the area around McCoy Cut have the largest portion of freshwater marsh.

The changes between the figures can be difficult to see due to color schemes, lack of reference objects, and pixel size. Circled on Figure 16 in red are three areas of change that were noted as a result of the model run. The areas that would be impacted appear to be minor.

Figure 15 – Marsh Pore Water Salinity (JST = 3,600)

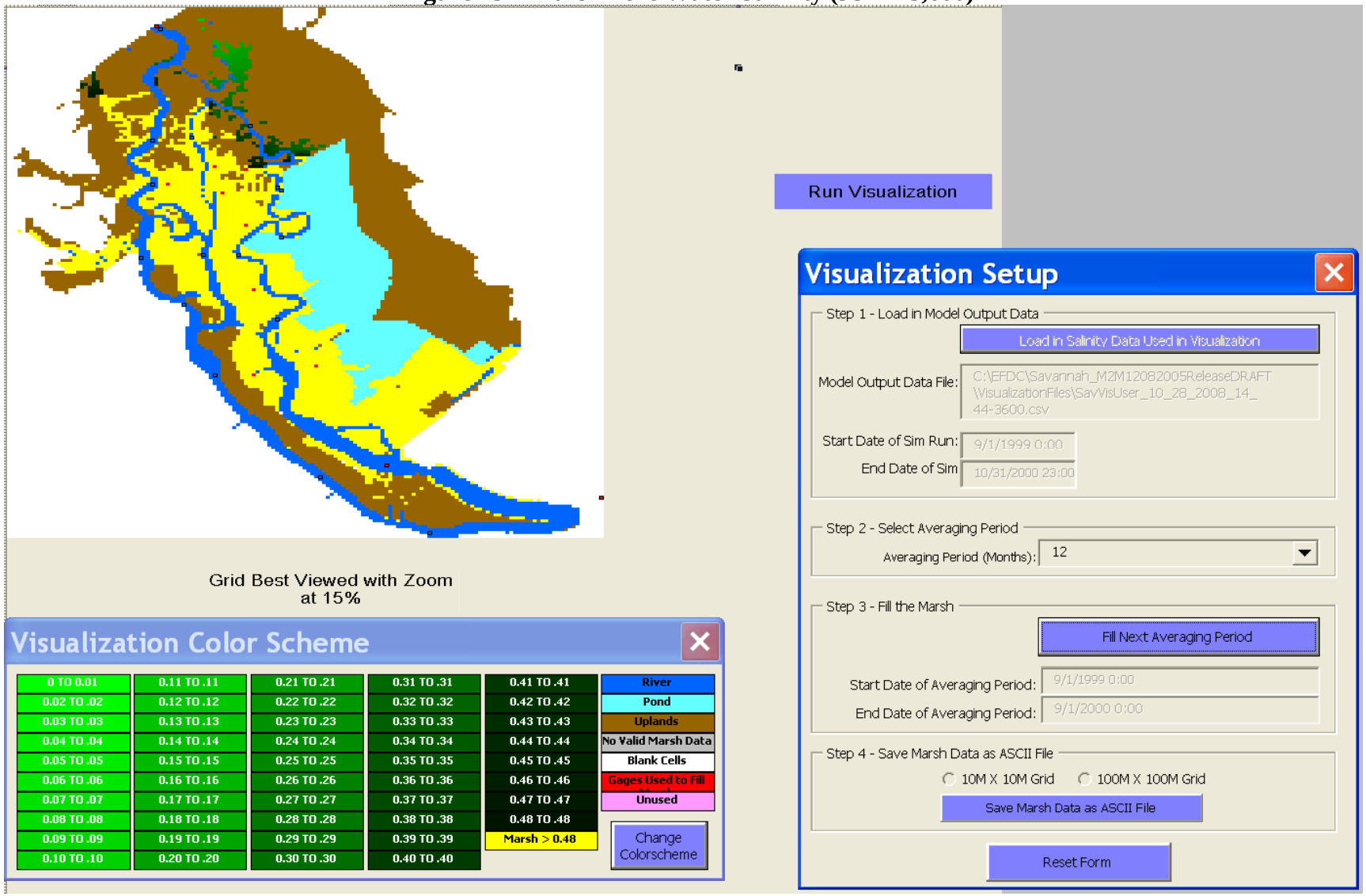
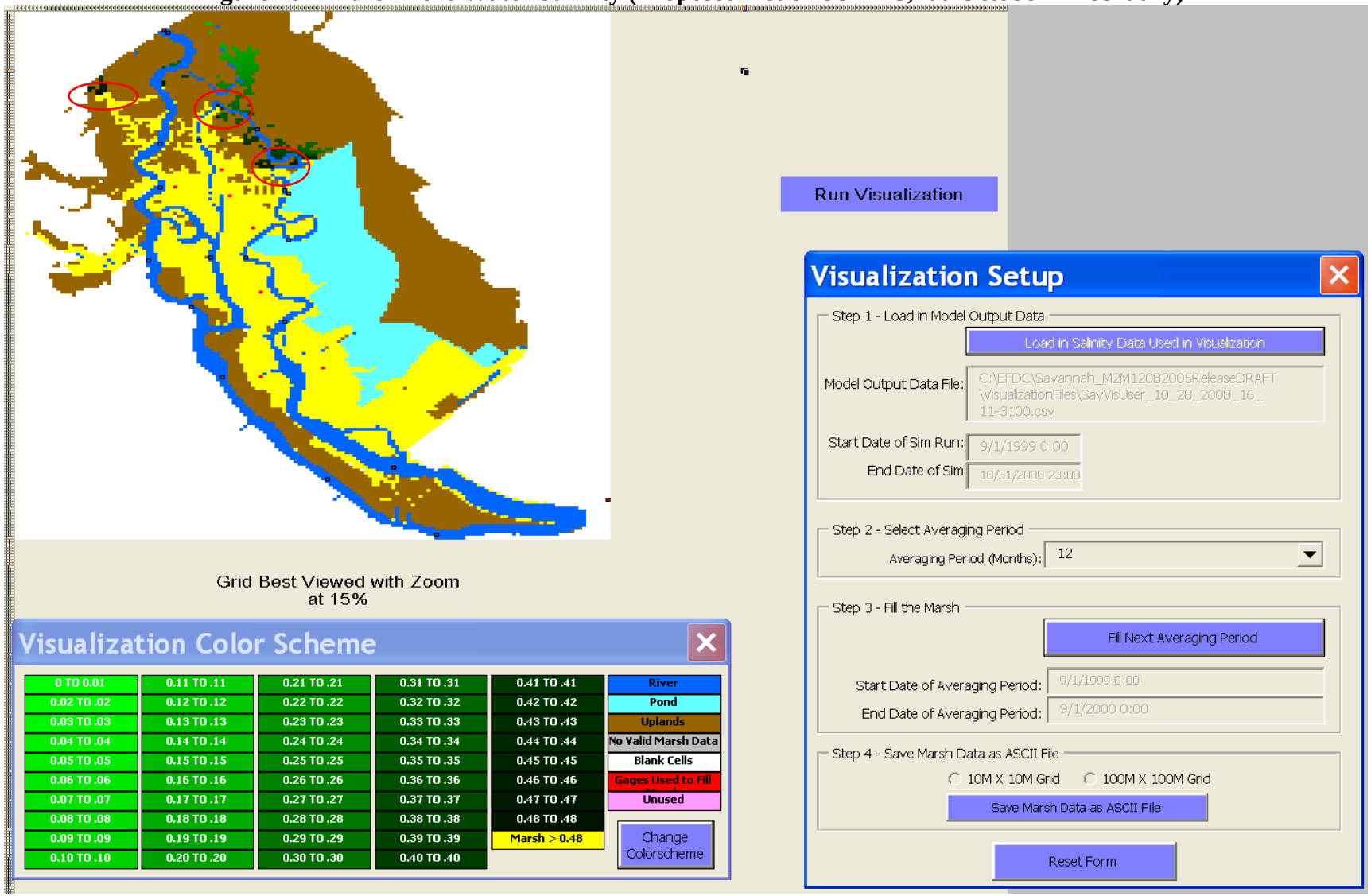


Figure 16 – Marsh Pore Water Salinity (Proposed Action JST = 3,100 October – February)



Summary

In summary, the District used the USGS M2M model to evaluate potential impacts to the tidal marshes adjacent to the estuary under implementation of the proposed flow reduction. The proposed action would limit average releases from J. Strom Thurmond Dam to 3,100 cfs during the winter season (November through February). The M2M model indicates that the Recommended Alternative would have a very small impact on the upper portion of the study area. The existing 3,600 cfs releases from the dam have caused the fresh/salt marsh boundary to move further into the estuary, to the upper portion of the immediate study area. Under the No Action Alternative, most of the freshwater marshes already experience salinity > 0.5 ppt and very little marsh areas could be considered as fresh.

As with any predictive tool, the M2M model has limitations. It is an empirical model and "the reliability of the model is dependent on the quality of the data range of measured conditions used for training or calibrating the model" (Conrads, 2006). USGS used a large dataset to develop the model, covering 4 gaging networks over multiple year periods with flows ranging from 4,320 to 39,600 in the marsh and 4,320 to 52,600 in the river. Considering the quality of the dataset and its large range, the M2M model is considered an appropriate tool to effectively analyze this issue.

Based partially on the increase in salinity occurring over only the fall/winter months (outside the main growing season) and the low impact predicted by the USGS M2M model, Savannah District believes that the proposed flow reduction would not result in substantial or significant impacts to tidal freshwater marshes in the estuary.

An adaptive management plan is in place to mitigate impacts should any significant increases in salinity are observed.

With Alternative 1, the freshwater / salt water interface would continue to be located downstream of the supply canal which feeds the Savannah NWR impoundments. Therefore, the alternative would not affect the Refuge or private lands' ability to provide fresh water to their managed impoundments.

4.6. THREATENED AND ENDANGERED SPECIES

The robust redhorse, shoals spider lily and the federally-listed shortnose sturgeon, manatee, and wood stork are the only Threatened or Endangered Species that may possibly be affected by small changes in flow.

Robust redhorse

Spider lily

Shortnose sturgeon

Effects of the NAA

Selection of the NAA and continuing with the existing Drought Contingency Plan would have no effects on threatened and endangered species above those that were previously approved. The NAA provides an average daily minimum flow of 3,600 cfs.

Effects of Recommended Alternative

As discussed earlier, this alternative provides an average daily minimum flow of 3,100 cfs. The decrease in predominant flows would occur during the cooler months, so potential impacts to seasonal fish spawning and fish passage, and impacts from deer grazing shoals spider lily should be minimal. The lower river levels could make shoals spider lily more susceptible to grazing from deer.

Spawning for the robust redhorse typically occurs from April through June. Flows of 3,600 cfs would be restored by that time under Alternative 1. Spawning by Shortnose sturgeon is believed to occur in February and March. Flows of 3,100 cfs during February may slightly reduce the spawning habitat that is available limit. In the Congaree River in SC, sturgeon have been found to spawn downstream of gravel bars that are covered by 6 to 15 feet of water (Collins et al. 2003). The roughly 0.5 foot decrease in water depth resulting from the proposed flow reduction could reduce the amount of spawning habitat that shortnose sturgeon determine to be acceptable. However, the small change in water depth compared to the range of depths that sturgeon have found to previously be acceptable indicate that this impact is likely to be minimal and immeasurable.

Anadromous species are unlikely to be within the shoals or upper river areas during the time of the proposed flow reduction; therefore, no adverse effects are anticipated to these species. Staging and foraging areas for these species may see slight alterations in salinities, but modeling indicates those effects would be small, so these highly motile species should easily adapt to these fluctuations.

Changes in river flow, salinity levels, and dissolved oxygen levels that are experienced by shortnose sturgeon and manatee are expected to be minimal and within the variation produced by the tides on a regular basis. The lower river levels could make fish more susceptible to predation from wood stork.

The Corps has determined that the proposed action may affect, but is not likely to adversely affect shortnose sturgeon, manatee, and wood stork. No effects to any other federally listed species were identified.

4.7. ESSENTIAL FISH HABITAT

The proposed flow reduction would alter Essential Fish Habitats in the estuary. Although the reduced flow volume would change velocities, the extent of those changes would be too small to be measurable. The primary noticeable effect would be an increase in salinity at the freshwater/saltwater interface. Salinity would move further into the estuary with the proposed action. This change would be temporary and would disappear when flows are increased in March 2009 or when normal rainfalls occur, whichever comes first. Savannah District believes that these temporary changes to Essential Fish Habitats do not warrant mitigation.

4.8. RECREATION

As evident in past droughts, recreation experiences diminish on Hartwell and J. Strom Thurmond Lakes as the lake levels drop. Public boat ramps and private docks become unusable as the lakes recedes. In addition, tree stumps and sand bars are exposed in the lakes. For some boaters, continued use of the lakes poses a serious threat to damaging boats and injuring persons. Swimming outside the Corps of Engineers' designated areas increases the potential for swimming fatalities. The expected ½ foot decrease in water depth in the river with Alternative 1 could result in minor adverse impacts to boaters and fishermen using the river.

4.8.1. Boat-Launching Ramps and Private Docks

The NAA will result in further impacts to boat ramps and private docks on the Corps reservoirs as the water continues to recede from the normal pool shoreline. The relative stabilizing effect resulting from Alternative 1 would increase the duration of use for the currently functioning structures within the conservation pools. Boat ramps along the river could be impacted by the expected ½ foot decrease in water depth with Alternative 1. This impact is minimized by the winter timing of the proposal, a season when there are fewer users of those facilities.

4.8.2. Swimming

Swimming at beach areas usually occurs from May to September. Therefore, the recommended alternative is occurring outside the normal season for swimming activities. Further, Alternative 1 is designed to maintain the conservation pools where swimming occurs. The NAA would result in further long-term impacts to the conservation pools and, subsequently, swimming areas.

4.9. WATER SUPPLY

Water shortages during drought are the performance measure used to determine the impacts of the alternatives in comparison to the NAA.

Hartwell Lake

There are eight water supply users with intakes in Hartwell Lake. Two (Anderson County Joint Municipal Water System and the City of Lavonia) currently hold water storage contracts with the US Army Corps of Engineers, Savannah District. Although Hart County Water and Sewer Utility Authority does not have an intake, it does have a water storage contract. Hart County

currently uses water from intakes owned by the Cities of Lavonia and Hartwell. The amount of water that they use from these two cities is charged against their water storage contract with the Corps of Engineers. The other six water supply users with intakes have riparian rights (City of Hartwell; Clemson University Musser Fruit Farm; Clemson University; Clemson Golf Course; Point West, Inc. formerly known as J. P. Stevens; and Milliken Company). Clemson University's Musser Fruit Farm intake becomes inoperable at 653 feet msl. Irrigation occurs between the months of June and August. When the intake is inoperable, they use water from the City of Seneca, but only if it is absolutely necessary because of the increased cost. The recommended alternative will increase the amount of water remaining in the conservation pool, resulting in positive effects to the water users in Harwell Lake by increasing the number of days they can withdraw water. The NAA would reduce the water supply available to users of this resource.

RBR Lake

There are 6 water supply intakes on RBR Lake. Two (City of Elberton and Santee Cooper) currently hold water storage contracts in RBR Lake with the US Army Corps of Engineers, Savannah District. Three have riparian rights (RBR State Park Golf Course, Mohawk Industries, and Calhoun Falls). One, the City of Abbeville, is in relation to mitigation for RBR construction. The highest intake elevation is 468.8 feet msl. The recommended alternative would increase the amount of water remaining in the conservation pool, resulting in positive effects to the water users in Harwell Lake by increasing the number of days they can withdraw water. The NAA would reduce the water supply available to users of this resource.

JST Lake

There are 8 water supply users with intakes on JST Lake. Seven (City of Lincolnton, City of Washington, City of McCormick, City of Thompson, Columbia County, Savannah Lakes POA Monticello Golf Course and Savannah Lakes POA Tara Golf Course) currently hold water storage contracts with the US Army Corps of Engineers, Savannah District. Hickory Knob State Park Golf Course has riparian rights. The City of Lincolnton has three intakes, one each at 321, 314 and 307 feet msl. If the highest intake at 321 feet msl is exposed, then the other two intakes can meet the water needs so that there are no shortages during a drought. This condition is the same for the City of Thompson and Columbia County that have three intakes one each at 320, 312 and 304. The golf courses have intake elevations at 324 feet msl. They experience water shortages with these intakes during drought periods. The recommended alternative will increase the amount of water remaining in the conservation pool, resulting in positive effects to the water users in Harwell Lake by increasing the number of days they can withdraw water. The NAA would reduce the water supply available to users of this resource.

Downstream of JST Lake

Water supply users downstream of the JST Lake include the Augusta/Richmond County (Canal and Shoals) and users with intakes in the NSBL&D pool including North Augusta, Mason's Sod, Kimberly Clark, Urquhart Station, PCS Nitrogen, DSM Chemical and General Chemical. Users below NSBL&D include International Paper, the Beaufort-Jasper County Water Supply Authority, Plant Vogtle, the City of Savannah M&I Plant, the Savannah National Wildlife Refuge and many other cities and municipalities. The NAA would not result in any immediate

changes for the current water users downstream of the JST Lake. Some users have experienced difficulties using their intakes under the flows associated with discharges of 3,600 cfs.

Water users along the Augusta Canal expressed concern about the recommended alternative. Diversions into the Augusta Canal are managed by the City of Augusta. The City operates three controllable gates to control flow to the Canal. Water in the Canal is used by four entities, as described in the following paragraphs.

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 uses that water to operate four turbines for water supply operations. These turbines provide the mechanical energy to drive pumps that lift water from the river for water supply purposes. The City usually uses two of its four turbines units (Units 1 and 4), requiring a flow of 1,364 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 on the Augusta Canal located 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 1,024 cfs; King Mill needs approximately 880 cfs; and Enterprise Mill needs a flow of approximately 560 cfs. The King Mill is the only operating manufacturing facility. The Sibley Mill has closed and generates income from its use of the water to generate electrical power. The Enterprise Mill has been converted to commercial and residential use; houses the Interpretative Center for the Augusta Canal National Heritage Area, and uses its allocation of water to generate electrical power for its tenants.

At the current level of Thurmond discharges (3,600 cfs) during Level 3 drought conditions, if there is no incremental flow between the dam and the Canal inlet, 3,600 cfs would flow to the Augusta Diversion Dam. USGS data indicates that in 2008 when discharges from Thurmond were at 3,600 cfs, the City maintained the canal gates at levels that resulted in an average of 3,150 cfs passing down the Canal and 450 cfs passing over the Shoals. After the City's turbines (1,363 cfs), there was roughly 1,787 cfs remaining in the Canal for the mills.

Under the recommended alternative, Thurmond releases would be reduced from 3,600 to 3,100 cfs from November through February. Comments provided by the City indicate that they would likely continue to divert the same amount of water into the Augusta Canal. Therefore, the proposed action is not expected to further affect water supply users on the Canal.

All water supply users downstream of the NSBL&D may need to modify their intakes if the drought continues and flows are reduced down the river. Some users indicate they are experiencing difficulties with discharges of 3,600 cfs. The extent of the environmental and economic impacts resulting from these future modifications is unknown. In general, the owners have yet to determine what actions they would need to take if river flows declined to the point that they are not supplemented by storage from the Corps reservoirs. Those modifications would be needed if the lakes reach Level 4 drought conditions and outflows equal inflows. With the inflow predictions made by the States (90% of 2007 inflows), those impacts would occur in 2011 under the No Action Alternative, but would be avoided with the Recommended Alternative. Some users may need to modify their intakes if Alternative 1 is implemented (flows reduced from 3,600 to 3,100 cfs). Some owners submitted comments on the proposed action to Savannah

District during public review of the Draft EA. They indicate they would monitor conditions at their individual intakes and seek to implement measures that would allow them to continue to withdraw their allotted amount from the river.

4.10. COASTAL ZONE CONSISTENCY

The proposed reduction of discharges from J. Strom Thurmond Lake would alter flows down the river to the estuary and the coastal zone. The flow reduction would affect salinity and dissolved oxygen levels in the estuary. It could also affect chloride levels at the City of Savannah's municipal and industrial water intake on Abercorn Creek. These potential changes were identified and discussed in Section 4.1 (Water Quality). The potential effects on freshwater vegetation in the estuary were identified and discussed in Section 4.5 (Biotic Communities - Estuary). The potential effects on endangered species were identified and discussed in Section 4.6 (Threatened and Endangered Species).

Recognizing the expected impacts identified and described in other sections of this document, Savannah District believes that the proposed temporary flow reduction is consistent to the maximum extent practicable with the enforceable provisions of both the Georgia and South Carolina Coastal Management Plans.

4.11. HYDROPOWER

A 500 cfs flow reduction from the three Corps dams would result in 13,000 MegaWatt Hours of additional shortage in meeting the contract hydropower generation energy requirement. That additional shortage is approximately 0.1% of the contractual energy requirement for the seasonal flow reduction period.

If sufficient water is available in the Mobile-managed basins, this power could possibly be generated by additional run time of hydropower units on those rivers. However, those basins are also presently experiencing a severe drought, so the likelihood that they could provide additional generating capability is small. SEPA could also purchase the additional power on the spot market to meet the additional contract requirements. That would increase SEPA's operating costs. The extent of that increase is not known. No immediate changes to hydropower are expected with the NAA.

4.12. CULTURAL RESOURCES

The Augusta Canal Authority indicates that flows <3,000 cfs would negatively affect the use of the Augusta Canal, a National Historic Landmark and a National Heritage Area, for recreational purposes, as well as operation of the Petersburg Tour Boats.

Savannah District provided the Draft Environmental Assessment to the Georgia and South Carolina State Historic Preservation Officers and eighteen Native American Tribes during the agency and public comment period.

Effects of the No Action Alternative

The NAA would have no additional adverse impacts to historic properties, as the existing SRBDCP of March 1989 would continue to be followed.

Effects of Recommended Alternative
Since the maximum pool levels at all lakes will remain the same and the minimum pool levels would be higher (reducing erosion of submerged archaeological resources), this alternative would produce no additional adverse impacts to historic properties in the lakes. The lower river flows are not expected to expose additional cultural resources, so no adverse effects are expected to historic properties in the river or estuary. Since flows are not expected to change in the Augusta Canal, no effects are anticipated to that resource.

4.13. ENVIRONMENTAL JUSTICE

Effects of the NAA
The NAA would have no adverse impacts on environmental justice as the existing SRBDCP of March 1989 would continue to be followed.

Effects of Recommended Alternative
This action would have effects along the entire length of the Savannah River Basin. The areas adjacent to the riverbanks and lakes do not support disproportionate concentrations of minority or low-income communities. Minority or low-income populations do not recreate on the river in disproportionate numbers. As a result, this alternative would not result in disproportionately high and adverse human health or environmental impacts on minority or low-income populations in the United States. It, therefore, complies with Executive Order 12898, "Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations".

4.14. PROTECTION OF CHILDREN

Effects of the NAA
The NAA would have no adverse impacts on the protection of children as the existing SRBDCP of March 1989 would continue to be followed.

Effects of Recommended Alternative

This action would have effects along the entire length of the Savannah River Basin. The areas adjacent to the riverbanks and lakes do not support disproportionate concentrations of children and children do not recreate on the river or lakes in disproportionate numbers. The proposed action would not result in a disproportionate risk or environmental impact to children that result from environmental health or safety risks within the meaning of Executive Order 13045. It therefore complies with Executive Order 13045, "Protection of Children from Environmental Health Risks and Safety Risks".

4.15. CUMULATIVE EFFECTS

Council on Environmental Quality regulations (40 CFR 150.7) require an analysis of the cumulative impacts resulting from the incremental impact of an action when added to other past, present, and reasonably foreseeable future actions, regardless of who undertakes these other actions. Cumulative impacts can result from individually minor, but collectively significant, actions. This cumulative impacts section of the EA addresses only the cumulative effects arising from considering the Proposed Action in combination with other ongoing or proposed actions in the Savannah River Basin.

The Savannah River does not function as it originally did, because of various changes. Several dams cross its flow, holding back high spring flows and raising low summer flows. Peaking operations at hydropower plants make the flows irregular during the course of day and week in some areas, rather than being primarily in response to rainfall events and seepage from adjacent wetlands. Numerous withdrawals of water occur, some for municipal use, some for industrial purposes, and others to aid adjacent recreation. The number of users of the river has increased dramatically. The ponded lakes that occur upstream of the dams provide sources for several types of recreation, and those sites are used heavily for those purposes. Fishermen use the free-flowing portions of the river, and their numbers have continued to increase with the overall growth in regional population.

If it were not for the multiple users of the river and lakes as they now exist, there would be little concern about the amount of water flowing in the river during a drought. But the goals and activities of many individuals, organizations, corporations, and government agencies are now affected by the amount of discharged from J. Strom Thurmond Lake to flow down to the ocean. Those users are expected to continue to conduct their activities on the lake and in the river in the future.

Although Savannah District is not aware of any specific plans to substantially increase the use of waters in the Savannah River Basin, we do expect some growth in both the number of users and the amount of water that is desired to be withdrawn from the lakes and river. The District is aware that Georgia Power would like additional water from the Savannah River for the proposed expansion of Plant Vogtle, near Waynesboro, Georgia. That proposed withdrawal may occur at some point in the future, but would not occur within the November – February time-frame that is under consideration in this EA.

The Savannah River is viewed by some located in other river basins as a ready source of clean water for their needs. If the regulating government agencies agree that additional inter-basin transfers can occur, stresses on existing uses along the entire length of the Savannah River basin would increase to some degree.

The proposed flow reduction would come on top of reduction that is presently being experienced by biological communities along the river and in the estuary as a result of the present drought. Resources that are stressed by the present drought may be further stressed by the proposed additional reduction in flow volume over the winter months. These stresses would constitute a cumulative adverse impact of the proposed action. However, if no action is taken and the drought continues to the point that Level 4 conditions are reached where outflow from Thurmond Lake equals its net inflow, these biological resources would likely experience these same, or greater, stresses. If operations shift to outflow equals inflow during the summer months, the stresses on biological communities would be much greater than if they are experienced during the winter months.

In summary, flows in the Savannah River have been substantially modified over time, but the basin still presents a multitude of opportunities for the use and enjoyment of this valuable resource. The number of people desiring to use or benefit from this resource continues to increase. The uses vary seasonally, with lower demands placed on the aquatic ecosystem during the winter months. As a drought intensifies or continues in duration, the stress on both the natural ecosystem and human uses of the resources increase. Long term adverse cumulative impacts would result primarily from increases in water usage and an accompanying loss of water from the river basin.

5.0 CONCLUSIONS

This Environmental Assessment considers the potential environmental impacts of the proposed action. The impacts listed for most of the resources in the table below are similar for the NAA and Recommended Alternative. However, the NAA has adverse impacts on conservation pool levels, water usage, recreation, boat-launching ramps and docks at Hartwell and J. Strom Thurmond Lakes, while the Recommended Alternative has positive impacts on these resources. The Recommended Alternative would have minor effects on downstream biological resources. These minor impacts would primarily occur to mussels in cut-off bends and species in the Augusta Shoals area. Temporary adverse impacts would also occur to freshwater wetlands in the estuary. However, failure to implement the Recommended Alternative could result in earlier implementation of Level 4 of the drought contingency plan. Implementation of Level 4 would likely result similar or greater impacts to these biological resources in 2009 – 2010 timeframe should the current drought continue. The Recommended Alternative would provide for a temporary deviation of the Savannah River Basin Drought Contingency Plan of March 1989, as updated in 2006. The conclusion of this Environmental Assessment is that the proposed action – reducing the minimum daily average release at J. Strom Thurmond Dam from 3,600 to 3,100 cubic feet per second while in drought Level 3 from November 1, 2008 through February 28, 2009 – would result in no significant environmental impacts.

Based on a review of the information contained in this EA, the District determined that a temporary modification to the Savannah River Basin Drought Contingency Plan of March 1989, would not constitute a major Federal action significantly affecting the quality of the human environment within the meaning of Section 102(2)(c) of NEPA. Accordingly, preparation of an Environmental Impact Statement is not required.

Table 8: Impact Summary

RESOURCE	NO ACTION ALTERNATIVE	ALTERNATIVE 1
Water Quality	No immediate adverse impact	Modeling by EPD suggests no adverse impacts will occur, but an adaptive management plan has been developed to address any issues, should they occur.
Biotic Communities-Lakes, Largemouth Bass Spawning, by observing the Pool Elevation Tables	Acceptable impacts, because the existing Drought Contingency Plan would continue to be followed	The objective of this alternative is to maintain the current level of the conservation pool and improve refill capability. Therefore no significant adverse impacts were identified.
Biotic Communities-Lakes, Aquatic Plants	No adverse impact	No adverse impact
Biotic Communities-Shoals	Acceptable impacts for the short-term. Could have impacts if drought persists.	Will reduce flows in the Shoals area. This could affect fish movement and mussels. Impacts would be attenuated due to the flow reduction occurring in the cooler months outside of spawning season.
Biotic Communities-Floodplain (Lower flows recommended here)	Acceptable impacts for the short-term. Could have impacts if the drought persists.	No impact to wetlands identified. Some sloughs and cutoff bends could be impacted by reduced flows. Mussels and other organisms in these areas could see adverse effects. Given the overall project area, these localized occurrences would be minimal.
Biotic Communities-Estuary	Acceptable impacts for the short-term. Could have impacts if the drought persists.	Modeling suggests that salinity increases of less than 1ppt will occur at the I-95 bridge. This could adversely affect freshwater wetlands. An adaptive management plan is in place should any significant increases in salinity be observed.
Threatened and Endangered Species	Acceptable impacts	May affect, but not likely to adversely affect listed T&E species (shortnose sturgeon, manatee, and wood stork).
Recreation, Boat-Launching Ramps and Docks	No immediate adverse impacts	No Adverse Impacts
Recreation, Swimming	No immediate adverse impacts	No Adverse Impacts

RESOURCE	NO ACTION ALTERNATIVE	ALTERNATIVE 1
Water Supply	Will impact water users on impoundments as this alternative will negatively impact the long-term stability of the conservation pools.	Some users in the Augusta Canal may experience a slight reduction in available water during the deviation period, but the effects would be minimal and would be outweighed by the benefits to users within the impoundments and long-term low flow augmentation capability for downstream areas if the drought continues or worsens.
Hydropower	No effect immediately. Persistent drought may induce prolonged shortages.	Total of 13,000 MegaWatt Hours of additional shortage or 0.1 % of contract requirement..
Biological Resources	No immediate effect. Long-term impacts would occur if the drought persists.	No significant impacts identified. An adaptive management plan is in place should any significant impacts be observed.
Cultural Resources	No additional adverse impacts.	No additional adverse impacts.
Environmental Justice	No adverse impact.	No disproportionately high and adverse impacts.
Protection of Children	No adverse impact.	No disproportionately high and adverse impacts.

6.0 RELATIONSHIP OF PROJECT TO FEDERAL AND STATE AUTHORITIES

The following table summarizes the status of the compliance of the proposed action (Recommended Alternative) with applicable Federal and State environmental laws.

Table 9: Summary of Requirements

FEDERAL POLICIES	PROPOSED ACTION
Anadromous Fish Conservation Act, 16 U.S.C. 757, et. seq.	In compliance.
Archaeological and Historic Preservation Act, as amended, 16 U.S.C. 469, et. seq.	In compliance. District's determination of no effect was coordinated with the SHPO in both GA and SC.
Clean Air Act, as amended, 42 U.S.C. 1857h-7, et. seq.	In compliance. Draft EA was reviewed with EPA.
Clean Water Act, as amended (Federal Water Pollution Control Act) 33 U.S.C. 1251, et. seq.	In compliance. Draft EA was reviewed by GA, SC, and EPA.
Coastal Zone Management Act, as amended, 16 U.S.C. 1451 et seq.	In compliance. Both GA and SC concurred in the District's CZM Consistency Determination.
Endangered Species Act, as amended, 16 U.S.C. 1531, et. seq.	In compliance. The District determined the project may affect, but not likely to adversely affect shortnose sturgeon, manatee, and wood stork. The USFWS concurred.
Federal Water Project Recreation Act, as amended, 16 U.S.C. 4601-12, et. seq.	In compliance.
Fish and Wildlife Coordination Act, as amended 16 U.S.C. 661, et. seq.,	In compliance. Draft EA was coordinated with the GA DNR, SC DNR, USFWS, and NMFS.
Fishery Conservation and Management Act of 1976, Public Law 99-659.	In compliance.
Magnuson-Stevens Act, as amended, Public Law 104-297.	In compliance. Draft EA with its EFH assessment was coordinated with NOAA Fisheries.
National Historic Preservation Act of 1966, as amended, 16 U. S. C. 470f, et seq.	In compliance. Both GA and SC SHPO concurred in the District's determination of no effect.
Protection of Wetlands, E.O. 11990	In compliance.
Environmental Justice, E.O. 12898	In compliance.
Protection of Children, E. O. 13045	In compliance.
Invasive Species, E. O. 13112	In compliance.

7.0 COORDINATION

Savannah District has coordinated with Federal and state officials during 2007 and 2008 as the drought continued in the Savannah River Basin. Some of the coordination has included the participation of other stakeholders. The meetings increased the understanding of the drought situation, monitoring which various stakeholders are presently performing, actions that could be taken to better manage the water resources at this time, and identified the resources which could be affected by various alternatives.

A Public Notice of Availability was issued on October 15, 2008, notifying the public of the availability of the Draft EA. This Notice served as the formal advertisement of the proposed temporary deviation to the 1989 Savannah River Drought Contingency Plan, as amended. The notice was sent to roughly 375 individuals and organizations that previously expressed an interest in projects conducted by Savannah District.

A Notice of Availability was published in the following local newspapers to inform the public of the availability of the Draft EA and invite their comments:

- Savannah Morning News
- Augusta Chronicle
- Greenville News
- Anderson Independent

The following natural resource agencies were provided a copy of the Draft EA:

- Georgia Department of Natural Resources, Environmental Protection Division
- Georgia Department of Natural Resources, Wildlife Resources Division
- Georgia Department of Natural Resources, Coastal Resources Division
- Georgia Deputy State Historic Preservation Officer
- Georgia State Clearinghouse

- South Carolina Department of Natural Resources
- South Carolina Department of Health and Environmental Control
- South Carolina Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management
- South Carolina State Budget and Control Board
- South Carolina Department of Archives and History

- US Environmental Protection Agency, Region 4
- US Fish and Wildlife Service, Field Supervisor
- US Department of Interior, Regional Environmental Officer
- National Marine Fisheries Service, Habitat Protection Division
- National Marine Fisheries Service, Assistant Regional Administrator

A copy of the Draft EA was sent to eighteen representatives of Native American groups that previously lived in the project area to inform them of the proposed action and invite their comments.

The District accepted comments on the proposal by mail, email, and over the telephone. As a result of the various avenues the District used to notify the public of the proposed action, it received numerous comments. Those could be grouped into the following categories:

Means of Communication	Support the Proposed Action	Do Not Support the Proposed Action	No Direct Comment on the Proposed Action
Telephone	96	0	5
Mail	25	5	7
Email	203	0	26

In their letter dated October 27, 2008, the US Fish and Wildlife Service concurred in the District's determination that the proposed action is not likely to adversely affect Federally listed endangered or threatened species under their jurisdiction – wood stork and manatee.

In their letter dated October 28, 2008, EPA Region 4 provided comments resulting from their review under the Clean Air Act. EPA expressed concern about potential impacts to downstream biological resources in cutoff bends, the Augusta Shoals, and to freshwater wetlands in the estuary. They also requested that monitoring be performed of the impacts to those resources. EPA also requested the Corps evaluate the effect of the proposal of implementation of TMDLs that they had issued for the river for dissolved oxygen, mercury, lead, and fecal coliform. The District has included the results of those evaluations in Section 4.1.3 of this Final EA.

The Georgia Department of Natural Resources, Coastal Resources Division concurred in the District's determination that the proposed action is consistent with the State's Coastal Management Program to the maximum extent practicable.

On October 29, 2008, the South Carolina Department of Department of Health and Environmental Control, Office of Ocean and Coastal Resource Management stated that the comments provided by SC DHEC represented their agency comments, including any on consistency with the State's Coastal Management Program. DHEC's letter supported the findings in the EA and the proposed temporary deviation to the Drought Contingency Plan.

In their letter dated October 24, 2008, the Georgia Department of Natural Resources, Environmental Protection Division stated that they thought the Corps properly presented information supporting a Finding of No Significant Impacts and reiterated their request for the temporary deviation to 3,100 cfs.

In their letter dated October 24, 2008, the South Carolina Department of Natural Resources concurred with the Corps' findings and recommendation, and urged implementation of the proposed action beginning November 1, 2008.

In their letter dated October 28, 2008, the South Carolina Department of Department of Health and Environmental Control stated that they support the proposed temporary deviation to the Drought Contingency Plan.

In their letter dated November 21, 2008, NOAA Fisheries state they concur with our determination that the proposed action is not likely to adversely affect Federally listed endangered or threatened species under their jurisdiction – shortnose sturgeon if we restore flows by February 1. The Corps agrees to that request. We intend to continue to coordinate with NOAA Fisheries on this issue. We would monitor conditions after flows are reduced to 3,100 cfs and report those conditions to the NMFS to identify whether the gravel bars downstream of Augusta are substantially impacted by the lower flow rate. Should the additional information indicate that the flow reduction could extend into February without adversely impacting shortnose sturgeon, NOAA Fisheries would provide separate approval for that action. Further coordination with other natural resource agencies or the public would not be required to continue the flow reduction through February.

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