STORAGE ANALYSIS FOR THE ACF, ACT AND SAVANNAH RIVER BASINS

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Abstract. The HEC-5 model is used to: 1) evaluate operational approaches for reservoirs in the ACF, ACT, and Savannah River systems; and 2) determine the impacts of future Atlanta area water withdrawals and increased minimum flows at Columbus, Georgia. A Dependable Capacity Operation approach is recommended. This approach maximizes economic benefits of hydropower and allows other water demands to be met through and beyond the year 2010.

PURPOSE

This study was performed by Camp, Dresser & McKee, Inc (CDM) and coordinated by the Atlanta Regional Commission(ARC) for DeKalb, Fulton and Gwinnett Counties, the Cobb-Marietta Water Authority, the City of Atlanta, the Columbus Water Works, and the Georgia Power Company. The purposes of the study were: 1) To evaluate, compare and suggest specific approaches to operating federal reservoirs in the Apalachicola-Chattahoochee-Flint (ACF), the Alabama-Coosa-Tallapoosa (ACT), and Savannah River Basins for a variety of conjunctive uses including hydropower, municipal and industrial (M&I) water supply, minimum flows for river water supply, water quality and navigation, and reservoir recreation; and 2) To determine the impacts of increased 2010 Atlanta area water withdrawals and increased minimum flows at Columbus for water quality and navigation under drought conditions, in comparison to present (1990) water demands in the ACF and ACT Basins.

BACKGROUND

Lakes Lanier and Allatoona, which currently provide most of the Metropolitan Atlanta Area's water supply, were planned, designed, and constructed during the late 1940's and early 1950's. These projects were built for flood control, hydropower, and in the case of Lanier, for navigation and water supply/quality flows for Atlanta. In recent decades recreation has assumed much greater importance.

In 1989, after 16 years, the U.S. Corps of Engineers recommended that the best alternative to provide water supply for the Atlanta Region and Lake Lanier communities was to "reallocate" or change a portion of the water storage in Lake Lanier from hydropower use to water supply use. The Corps also proposed a minor reallocation of Lake Allatoona to meet a portion of the Region's future needs.

In June of 1990, the State of Alabama, later joined by the State of Florida, sued the Corps for inadequate consideration of downstream impacts. In order to address concerns precipitating the Alabama lawsuit , the Corps and the states of Alabama, Georgia, and Florida entered into a Memorandum of Agreement to perform a comprehensive study of all major water-management objectives in the ACF and ACF Basins. The study is designed to determine the capabilities of the basin's water resources. It will describe demands, water availability, evaluate alternatives and recommend a coordination mechanism for basinwide management and dispute resolution. Initial results are scheduled for Fall, 1995.

Water managers in the Atlanta Region wanted to conduct a surface water model project to better understand the water resources system and the conjunctive uses of reservoir storage. The Columbus Water Works joined the project to explore the feasibility of maintaining higher flows at Columbus for water quality and navigation.

STUDY AREA

Three river/reservoir systems were included in this effort: the Apalachicola-Chattahoochee-Flint River Basin (ACF) which stretches from the north Georgia mountains to the Gulf of Mexico; the Alabama-Coosa-Talapoosa River Basin (ACT) which extends from the north Georgia mountains to Mobile Bay in Alabama; and the Savannah River Basin from north Georgia and North Carolina to the Atlantic Ocean. The surface water model simulates operations for multiple uses in the ACF and ACT Basins. The Savannah River Basin Reservoirs were included only for the purpose of simulating their contribution to the hydropower system.

Hydropower energy and capacity from 10 federal reservoirs in these basins are marketed as part of a federal hydropower system known as the Georgia-Alabama-South Carolina system. The projects which make up this system are U.S. Army Corps of Engineers projects and include: Hartwell, Russell, and Thurmond Dams on the Savannah River, Buford, West Point, and Walter F. George on the Chattahoochee River, Allatoona Dam on the Etowah River, Carters Dam on the Coosawattee River and Jones Bluff and Millers Ferry Dams on the Alabama River.

A federal agency, the Southeastern Power Administration, markets the power from this system and therefore the 10 dam system is commonly referred to as the SEPA system.

Although the Jim Woodruff project in the ACF Basin is included in the model, the hydropower energy and capacity results were not included in summaries because its power is not marketed as part of the 10 dam system. Also included in the study were 12 non-federal hydropower reservoirs owned by the Georgia Power Company and the Alabama Power Company (APCO) and two nonpower reservoirs. Non-federal reservoirs on the Talapoosa and Flint were not included.

OPERATIONAL APPROACHES ANALYZED

The study looked at three different operational approaches for providing hydropower capacity and energy in conjunction with other nonpower demands. The three approaches analyzed include:

1. **Dependable Capacity Operation.** This approach is a conservation based approach. Its intent is to conserve storage and minimize releases in manner so that the essential uses of all users can be met. Hydropower releases are conjunctive with most other uses and determined by the firm energy available to support dependable capacity of the system. This is the capacity that is dependable to displace thermal generating capacity. If hydro-capacity is not dependable and power users must purchase power from existing thermal sources during drought, then the hydropower allocation really wasn't essential and could be put to other water dependent uses.

This approach operates the river/reservoir system to produce the amount of peaking hydropower that is dependable during the critical period of drought. A worst case planning level approach is used which assumes that only the generating capacity of the hydro system that can be made simultaneously available to displace thermal capacity in the load can be considered dependable. The average hours of use of the system is the number of hours per weekday averaged over a year that the full system's capacity can actually be made available during the critical drought.

Two and one half (2 1/2) average hours use was used as the basis for the dependable capacity alternative approach.

2. **SEPA System Contract Minimum Energy.** The approach maximizes energy generation rather than capacity. This approach operates the system for 4 hours average use per weekday on an average annual basis. This was chosen because It more closely reflects SEPA's monthly contract minimum energy commitments which are based on the combined output of all system projects operating from 107% to 131% of the rated capacity of the projects for 4 hours per weekday on an average annual basis.

3. **Corps Water Control Plans.** This approach associates releases with pool levels and not actual demands. In 1989 the Corps of Engineers developed a water control plan for the ACF Basin. In 1993 a Water Control Plan was developed for the ACT Basin. Theses plans define "action zones" for each of the major storage projects in the basins. These zones are used to determine minimum hydropower generation at each project, as well as the maximum possible assistance for navigation from conservation storage. The Corps water management strategy is to balance operation among purposes and projects. Releases from projects will be balanced as near as possible so that the reservoir pools in the same basins will be in the same zones at the same time. The number of hours use associated with the Water Control Plans varies by zone. In the ACF, Zones 1 & 2 varies from 4 to 3 hours use and Zones 3 & 4 vary from 3 to 2 hours use. In the ACT, Zone 1 is 4 hours and Zone 2 is 2 hours use.

METHODOLOGY

The HEC - 5 Model.

This study used the Corps of Engineers' computer program, *HEC-5 Simulation of Flood Control and Conservation Systems* which is referred to as HEC-5. HEC-5 is used to account for surface water at various locations in a river basin, over a given period of time. The program was developed by the Corps of Engineers' Hydrologic Engineering Center (HEC) to assist in allocating flood control and conservation storage in a reservoir system. It imitates (simulates) the operation of a system of reservoirs in a river basin and is therefore called a simulation model. The program can therefore be used to determine the impact of alternative ways in which a system of reservoirs are operated.

The main demands for water storage from a reservoir that can be simulated by the HEC-5 program include:

- Municipal and industrial water supply from reservoirs and downstream;
- Hydroelectric power generated at the dam;
- Control of downstream flooding;
- Assurance of minimum flows to assimilate wastewater discharges
- Adequate river levels to assure navigation

The HEC-5 model consists of two basic components: reservoirs and control points. These components are connected by river channels. Figure 1 includes the federal and non-federal reservoirs and control points included in the HEC -5 model for this study.

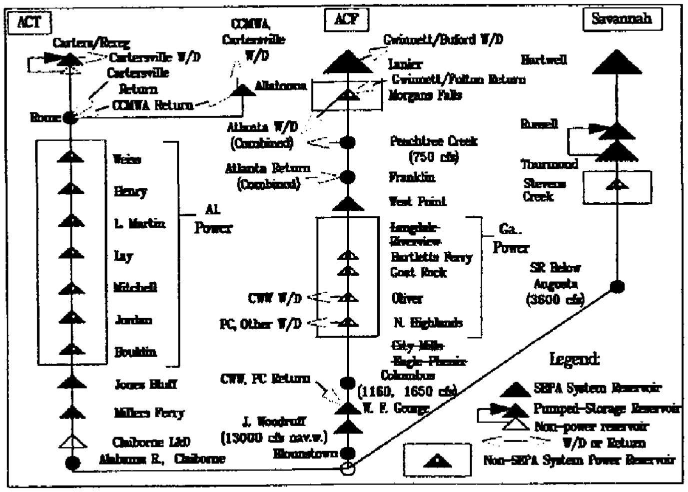


Figure 1. Model Schematic

Critical Period/Stream Flow Conditions

Three periods were analyzed to represent different flow conditions:

1. The **1985-89 drought** is the critical drought of record i.e., the most severe combination of hydrologic and storage demand circumstances the system has experienced yet.
2. The **1980-81 drought** is the drought used by SEPA as the critical drawdown period for its contract minimum energy commitments. This drought is about the fourth or fifth worst drought experienced in the SEPA system since the 1920's.
3. The **1975-79 period** was used to represent a "normal" period in the ACF Basin and the **1976-79 period** was used to represent a "normal" period in the ACT Basin.

The drought periods were used to characterize the most severe impacts of water management alternatives, and the "normal" period to characterize the average effects of these alternatives over a longer continuous period.

Table 1: Municipal and Industrial Withdrawals and Returns

	1990		2010	
ACF	Withd.	Return	Withd.	Return
Lanier	51.5		105	
Chatt/Atl. Area	249.0	238	379.2	331.7
Above W.Point	44.5		44.5	
L Oliver/Columbus	67.9		75.1	
Chatt/Columbus	23.3		23.3	
Chatt/Below Colum		101.8		107.6
ACT				
Allatoona	49.8	11.2	82.0	30
Etowah		3.4		16.2
Carters Lake	29.1		41.1	
Oostanala		1.5		10.5

Minimum Flows

The following targets were included for minimum flows:

ACF Basin

- 750 cubic feet per second (cfs) on the Chattahoochee River at the Atlanta intake, for both 1990 and 2010 conditions.
- 1,160 cfs in 1990 and 1,650 cfs in 2010 at the Columbus gage on the Chattahoochee River.
- 7,500 cfs on the Apalachicola River at Blountstown gage downstream of Jim Woodruff for all periods outside the navigation windows described in the navigation section below.

ACT Basin

- 240 cfs for both 1990 and 2010 from Allatoona and the Carters reregulation dam.
- A constant minimum "navigation" release from the Millers Ferry project of 6,000 cfs for both 1990 and 2010 conditions.

Savannah River

- The only minimum flow target imposed in the HEC-5 analysis of the Savannah River reservoirs was 3,600 cfs from Thurmond.

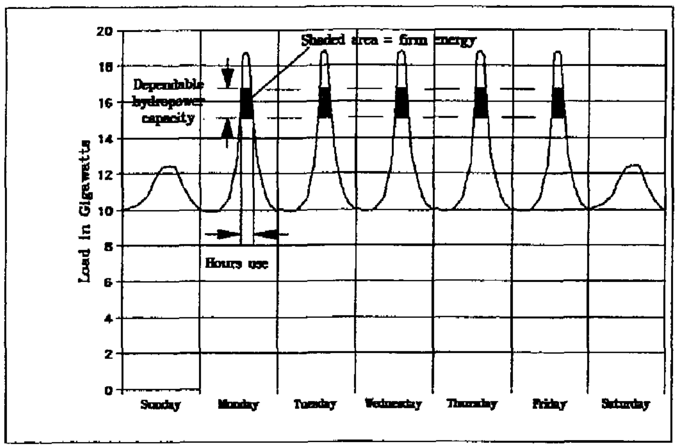
Navigation

The magnitude of continuous flow required to support continuous navigation is 13,000 cfs. Less than half of the total conservation storage within the ACF Basin needed to assure this flow for full-depth navigation is available throughout the 1985-89 drought no matter what other demands are imposed. Therefore, navigation windows are the assumed in this study as the most effective means of providing for navigation and the following flows were included in the HEC-5 model for navigation: Navigation "windows" represented by continuous minimum flows on the Apalachicola River at the Blountstown gage downstream of Jim Woodruff of 10,000 cfs during the months of July and August, for both present and future conditions; a minimum flow target of 7,500 cfs was maintained for all periods outside the navigation window.

Hydropower

Role of Hydropower in Power Supply. In the southeastern United States, hydropower is used to supply part of the peak power load. Figure 2 shows a typical weekly demand curve. Typically nuclear and efficient coal-fired steam supplies the continuous 24 hour baseload. Less efficient coal and oil supply the intermediate increment, and hydropower turbines and gas powered combustion turbines the final peak load.

Figure 2



Dependable Capacity, Firm and Non-firm Energy Concepts. The dependable capacity of a hydropower system is its load-carrying ability under adverse circumstances such as extended drought. Energy representing the product of the dependable capacity is known as firm or primary energy. The economic benefits of hydro capacity are the avoided capital costs of thermal generating facilities that do not have to be built. Energy that is available under less adverse conditions but cannot be supplied during the most adverse conditions, as well as energy not available during peak times of the load, is called non-firm or secondary energy. The economic benefits of non-firm energy are the costs of the thermal fuel and operating costs it displaces. Dependable capacity and its firm energy have more value that non-firm energy. Average annual energy is made up of firm energy (energy available to make the capacity dependable in the load through the critical period), plus non-firm energy (all other than firm).

Consider the following examples. A megawatt of hydroelectric capacity is dependable if it can carry one megawatt of the load for the number of hours of the peak. If the load shape is such that the peak happens to be 8 hours wide, 5 days per week, and a megawatt of hydroelectric capacity operates for 4 hours (on average) and empties the reservoir during the critical period, then none of this peaking capacity is dependable. However, if the output is reduced by half for the full 8 hours so that the reservoir just touches the bottom, the dependable capacity would be 0.5 MW. Conversely, if the streamflow and yield of the storage permit a 1-MW plant to operate for 12 hours at full capacity each weekday through the critical period, the dependable capacity would not be more that 1 MW, because no additional capacity could be supplied during the 8-hour peak. In this case, a water withdrawal from the reservoir that reduces the powerplant's hours use from 12 to 8 hours would reduce the energy output by 33% [(12-8)/12], but would not reduce the dependable capacity at all, because 1 MW would still be supplied across the 8-hour peak. Finally, no matter how many hours the plant's full capacity would be available during average-flow years, the dependable capacity is no more than what can be supported by firm energy available during the critical drought period.

Hours Use and Monthly Distribution. The hours use in this project represents the total annual firm energy to support dependable capacity distributed over all the weekdays in a drought year as shown in the figure above. Weekday hours use varies monthly in proportion to the SEPA system monthly distribution.

Flood Control

Because the primary purpose of this HEC-5 study was to investigate the effects of drought management strategies, the impacts of these strategies on maximum flood discharges and downstream flood gages were not determined. The simulation periods included two droughts and one "normal" flow period, none produced inflows filling significant portions of the flood control storage in the large reservoirs. Maximum limiting releases at all federal and non-federal reservoirs, consistent with Corps' reservoir regulation manuals were included in the HEC-5 model.

Seasonal flood control rule curves. The top of conservation pool is the bottom of flood control storage, and can be varied monthly in HEC-5 to reflect seasonal flood control rule curves. Several scenarios in this study modified these ranges in order to analyze the benefits of decreasing the seasonal drawdown for flood control storage to increase conservation storage. Also, ranges were modified by the Corps' Water Control Plans were included in the model runs. In all cases, the higher rule curve elevations occur during the summer months, drawing down in the fall and winter, then filling during the spring.

Scenarios. The following tables outline the scenarios analyzed as part of this study.

Table 3 Scenarios

Scenario	Non-Power Demands	Period	Other
ACF Basin			
Dependable Capacity - 2-1/2 Hours Use			
(1)	1990	1985 - 89	
(2)	2010	1985 - 89	
(3)	1990	1975 - 79	
(4)	2010	1975 - 79	
(5)	1990	1985 - 89	(reduced seasonal drawdown)
(6)	2010	1985 - 89	(reduced seasonal drawdown)
(7)	1990	1975 - 79	(reduced seasonal drawdown)
(8)	2010	1975 - 79	(reduced seasonal drawdown)
Contract Minimum Energy - 4 Hours Use			
(9)	1990	1985 - 89	
(10)	2010	1985 - 89	
(11)	1990	1980 - 81	
(12)	2010	1980 - 81	
(13)	1990	1975 - 79	
(14)	2010	1975 - 79	
Water Control Plan - 2-4 Hours Use			
(15)	Present	1985 - 89	(action zones)
(16)	2010	1985 - 89	(action zones)
(17)	Present	1975 - 79	(action zones)
(18)	2010	1975 - 79	(action zones)
ACT Basin			
Dependable Capacity - 2-1/2 Hours Use			
(1)	1990	1985 - 89	
(2)	2010	1985 - 89	
(3)	1990	1976 - 79	
(4)	2010	1976 - 79	
(5)	1990	1985 - 89	(reduced seasonal drawdown)
(6)	2010	1985 - 89	(reduced seasonal drawdown)
(7)	1990	1976 - 79	(reduced seasonal drawdown)
(8)	2010	1976 - 79	(reduced seasonal drawdown)
Contract Minimum Energy - 4 Hours Use			
(9)	1990	1985 - 89	
(10)	2010	1985 - 89	
(11)	1990	1980 - 81	
(12)	2010	1980 - 81	
(13)	1990	1976 - 79	
(14)	2010	1976 - 79	
(15)	2010	1985 - 89	(5 hours use of Carters)
(16)	2010	1985 - 89	(6 hours use of Carters)
Water Control Plan - 2 to 4 Hours Use			
(17)	1990	1985 - 89	(Allatoona action zones)
(18)	2010	1985 - 89	(Allatoona action zones)
(19)	1990	1976 - 79	(Allatoona action zones)
(20)	2010	1976 - 79	(Allatoona action zones)
Savannah Basin			
Dependable Capacity - 3-1/4 Hours Use			
(1)	None (3,600 cfs minimum release from Thurmond only)	1985 - 88	
Contract Minimum Energy			
(2)	None (3,600 cfs minimum release from Thurmond only)	1985 - 88	
(3)	None (3,600 cfs minimum release from Thurmond only)	1980 - 81	

FINDINGS

Hydropower

Dependable Capacity. This operation maximizes economic benefits of hydropower and allows other water demands to be met through and beyond the year 2010. In the ACF Basin, with 2 1/2 hours use, there is no loss of dependable capacity and a loss of non-firm energy of 20,250 MWH with a net economic impact on federal hydropower of \$2.7M from 2010 water supply. In the ACT Basin there is a loss of 0.6 MW of dependable capacity, 526 MWH firm energy and 7,820 MWH non-firm energy due to 2010 water demands with a net economic impact present worth cost of \$2.4 M. In the Savannah Basin the model showed that 3 1/4 hours use could be delivered by the projects in that system.

Reduced seasonal drawdown at lakes Lanier, West Point and Walter F. George and Allatoona coupled with dependable capacity based operation produces greater net hydropower economic benefits. Reduced seasonal drawdown could nearly offset the cost of 2010 water supply at Lake Allatoona.

Contract Minimum Energy. The SEPA System cannot deliver firm energy representing 4 hours use during conditions such as the 1985-89 drought. If this is attempted the model shows that dependable capacity in the system would be reduced by 53%. All three ACF projects would be emptied and Lake Allatoona would draw down and remain empty for much of the critical period. The present worth of lost capacity and energy benefits due to increasing the hours use from 2 1/2 to 4 hours use is approximately \$1.5 billion present worth.

Because SEPA contract minimum energy is based on the 1980-81 period rather than the more severe 1985-89 critical period, 4 hours average use represents a significant over commitment of the system. Although the ACF and ACT Basins could be operated to provide 4 hours use per day during the 1980-81 period, if the systems are operated in this manner there would not be sufficient water remaining in storage to supply the non-power uses of water if the drought continued another 2 to 3 years. The purchase of replacement energy by SEPA from outside the system would not alleviate severe water shortages as the drought continued. As a result, reservoir recreation, downstream minimum flows and other non hydropower uses would be severely impacted with no gain in hydropower economic benefits.

Corps Water Control Plan. The water control plans do not impose firm energy targets according to seasonal demand. Instead, energy generation at each project is targeted to pool elevation within "action zones". As a result, only the energy generated in the lowest action zone, representing 2 hours full-capacity generation per weekday can be considered dependable. Although impacts could not be separately determined, 2010 water demands would have essentially no economic impact on hydropower benefits with this type of operation.

Water Supply

2010 Municipal and Industrial (M&I) water supply withdrawals from Lake Lanier and the Chattahoochee River could reliably be met through 1985-89 conditions with either Dependable-Capacity based operation or Corps' Water Control Plan operation.

- Lake Allatoona could reliably supply CMWA's 2010 water demand through 1985-89 conditions under any of the following operations:Dependable-Capacity based operation (2 1/2 hrs. use) with reducing required seasonal drawdown from 17ft. to 14ft.
  - Corps' Water Control Plan
  - 2 hrs. per weekday hydropower generation
- M&I water supply for the Atlanta Region could <u>not</u> reliably be met through 1985-89 conditions when 4 hrs. use per weekday hydropower generation are attempted to be supplied as the SEPA System Contract Minimum Energy based operation described in this report.

Minimum Flows

ACF Basin

- The reliability of the 750 cfs minimum flow at Peachtree Creek during severe drought conditions is not significantly affected by 2010 water demands under either Dependable-Capacity based operation or the Corps' Water Control Plan operation. The reliability of this minimum flow would be slightly enhanced under the Water Control Plan operation in comparison to Dependable-Capacity but this slight increase in reliability comes at a significant increase in Lanier drawdown (more than 14 feet).
- System Contract Minimum Energy based operations would result in reduced reliability of 750 cfs at Peachtree Creek during severe drought conditions with <u>existing and future</u> water supply.
- Both present (1,160cfs) and future (1,650cfs) minimum flows at Columbus can be reliably maintained under all three operational approaches analyzed.
- Flows into the Apalachicola Bay as measured at the Blountstown gage would not be significantly reduced. Increased future (2010) water demand will reduce average flow by only 0.8% during drought of record conditions.
- During periods of normal flows, typified by the 1975-1979 period, all three types of operation would reliably maintain minimum flows.

ACT Basin

- No significant shortages of the minimum release from Allatoona or the minimum flows at Claiborne were found to exist with either Dependable Capacity based operation or Corps' Water Control Plan operation.
- Under SEPA System Contract Minimum Energy based operation, significant shortages with present and future water demands would occur in Allatoona's releases.
- Shortfalls in the 240 cfs minimum release from the Carters reregulation dam could occur with System Contract Operations.

Navigation

ACF Basin. Full depth navigation (13,000cfs) cannot be maintained continuously throughout critical drought (1985-89) conditions under any reservoir operating scheme, regardless of any other water demands. This is because total conservation storage in all ACF reservoirs (1.9M acre-feet) is less than that required to support continuous navigation flows.

- Navigation windows can provide an effective means of maintaining full-depth navigation for shorter periods during the late summer months (when flows are typically lowest), or of maintaining partial-depth navigation (10,000cfs) for longer periods.
  - Full- depth navigation flows (13,000 cfs) would be available 40% of the time during the critical drought with navigation windows and 80% of the time during normal conditions under Dependable Capacity based operations
  - Partial depth navigation flows (10,000 cfs) would be navigation windows and 93% of the time during normal conditions under Dependable Capacity based operations.
  - Minimum depth navigation (7,500cfs) would be available 100% of the time under Dependable Capacity based operations.
- Increased future water supply will not reduce the reliability of navigation windows.
- The reliability of navigation windows would not be affected by contract minimum energy.
- Under Water Control Plan operations the 60-day navigation windows must be reduced from 10,000 cfs to 9,000 cfs.

ACT Basin

- Future increases in water demand would not significantly affect the reliability of flows at Millers Ferry under any operating scheme.

Recreation/Reservoir Levels

Reservoir recreation as an operating objective seeks to minimize reservoir drawdown and fluctuation. Minimum and average reservoir levels are used as the two criteria for assessing alternative operating strategies. The relative benefits of Dependable Capacity-based, SEPA System Contract Minimum Energy-based, and Corps' Water Control Plan operating strategies were compared based on minimum reservoir elevation during 1985-1989 critical drought conditions and average reservoir elevation during "normal" flow conditions (1975-79 in the ACF Basin and 1976-79 in the ACT Basin).

- Increased 2010 water supply would have minimal effect on drawdown of federal reservoirs in the ACF Basin. However, the operational approach does have a significant impact on reservoir levels.
- **Lanier**-Dependable Capacity-based operation would result in much less drawdown of Lanier during 1985-89 critical drought conditions than either SEPA System Contract Minimum Energy based or Corps' Water Control Plan operation. Lanier would draw down to 1964.2 with Dependable Capacity-based operation and 1990 water demands, and to 1059.6 with 2010 water demands. The Corps' Water Control Plan would result in a drawdown of 1051.4 with 1990 demands and 1045.2 with 2010 demands. With SEPA System Contract Minimum Energy, Lanier would drawdown to 1035 with 1990 and 2010 demands. Reducing seasonal drawdown would not significantly affect Lanier's critical drawdown or average annual drawdown.
- **West Point**- The Water Control Plan reduces West Point drawdown by 2 feet as compared to the other operational plans, however, this is due primarily to the 3-foot reduction in the lake's seasonal drawdown already incorporated in the Water Control Plan. Dependable Capacity based operation when coupled with a reduction of seasonal drawdown by 3 feet reduces drawdown during the critical period by approximately 7 feet and reduces average annual drawdown during "normal" flow conditions by approximately 2 feet, with both 1990 and 2010 water demands.
- **Allatoona**-This is the limiting reservoir in the SEPA system. Conservation storage would be just implied under Dependable Capacity Operation. Under SEPA System Contract operations the reservoir would empty and remain empty for long periods of time. SEPA System Contract operations would keep the reservoir empty for prolonged periods of time during the critical drought conditions. The Corps Water Control Plan would reduce drawdown by 7 to 9 feet as compared to the other operational approaches.
- **Carters**-SEPA System Contract based operation would result in increased drawdown and pool fluctuations. Additional generation and pumping at Carters to supply the SEPA system f firm energy shortfall during 1985-89 drought conditions would result in Carters and its reregulation dam being emptied. Daily pool fluctuation in Carters could reach as high as 3 feet, and 30 feet in the reregulation dam, unsustainable by any measure.
- **Millers Ferry and Jones Bluff**-would experience no significant change in reservoir levels due to future water demands, under any of the three operating approaches.

CONCLUSIONS AND RECOMMENDATIONS

Dependable Capacity Based Operation Recommended. The Dependable Capacity based operational approach representing 2 1/2 hours use provides an opportunity to maximize the benefits of the federal reservoirs in the ACT/ACF River Basins for all users. This analysis shows that it is the preferred water management approach followed second by the Corps Water Control Plans. The Contract Minimum Energy approached based on 4 hours use of the SEPA system would severely impact reservoir levels with no compensating benefits, and is not recommended.

Dependable capacity based operation is uncomplicated: Operational targets for each reservoir in the system would be fixed at what the system as a whole could deliver through the established critical period any time its level falls below top of conservation pool. During periods of normal or above-normal flow, reservoirs would stay full and surplus water would enable operational targets to be exceeded until the pool again falls below its top of conservation level.

Water Supply. Future 2010 water supply will have minimal impact on other users of the system. The reduction in hydropower energy and capacity benefits due to the increased 2010 water demands of the study participants are $2.7 million in the ACF Basin and $2.4 million in the ACT Basin.

Navigation. Navigation windows should be established as the means for maintaining full depth navigation for shorter periods during the late summer months or partial depth navigation for longer periods. No operational strategy can maintain full depth navigation year round during 1985-89 conditions.

Seasonal Flood Control Reduction. The historical rationale for creating seasonal flood control storage has been that as much flood control storage as possible should be made available in advance of the spring wet season, during which floods can be stored to refill conservation storage to its maximum level. The problem with this approach is that the seasonal distribution of floods in the eastern United States is not well defined. Many floods of record have occurred during the summer months when seasonal flood control storage is at a minimum, examples include the recent flooding in Georgia this past summer and flooding in the Mississippi River Basin several years ago.

The reduction of seasonal flood control should be further evaluated to increase the long term use of storage for all users. A reduction of 3 feet in the seasonal drawdown of Allatoona and West Point reservoirs is recommended.

Single Drought Period for Planning All Uses. A single critical drought period should be adopted for determining the yield of storage for all purposes. This period should be rare and of sufficient duration for the assumed risks to be reasonable. The 1980-1981 drought is not recommended because, while intense, it was not of sufficient duration. Three or four regional droughts of greater intensity and/or duration have occurred since 1927, with the 1985-1989 period being equivalent back-to-back 1980-1981 droughts.

Hydropower Marketing. New hydropower marketing arrangements should be made for the sale of federal hydroelectric power in the ACF and ACT Basins that reflect the dependable capacity and firm energy available during the 1985-1989 critical period. These arrangements should be revenue-neutral to maintain the payback schedule on the federal projects, and should assure less firm energy but more dependable capacity than the current contract between SEPA and its preference customers.

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