BALANCED INSTREAM FLOW MANAGEMENT IN A MULTI-USE ENVIRONMENT: THE AUGUSTA CANAL HYDROPOWER PROJECT

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Abstract. The City of Augusta, Georgia operates the Augusta Canal as a raw water source, for hydropower to pump raw water, to supply water to independent hydropower entities, and for other important uses such as recreation and aesthetics. In the context of obtaining a Federal license to operate the project, Augusta is now in the process of balancing water needs among multiple uses in a river system highly managed by the U.S. Army Corps of Engineers. Augusta performed an instream flow study on the portion of the Savannah River bypassed by the Canal, a unique habitat known as the Augusta Shoals, and evaluated Canal user needs. The City is developing a Canal Operations Plan to guide integrated operations while providing balanced consideration of aquatic life, municipal needs and industrial uses.

INTRODUCTION

The historic Augusta Canal, owned and operated by the City of Augusta, Georgia (Augusta) has served the citizens of Augusta-Richmond County since 1845 by providing raw water supply, hydropower, and navigation. Barge traffic in the Savannah River no longer utilizes the Canal to bypass the shallow Augusta Shoals of the Savannah River, but raw water supply and hydropower remain as key features of the Canal's purpose and future mission. Additionally, the Augusta Canal is important for recreation, aesthetics and as the home of significant archeological and historic sites.

Augusta is in the process of seeking a license from the Federal Energy Regulatory Commission (FERC) to operate the Augusta Canal Hydropower Project (ACHP). The ACHP diverts a portion of the flow of the Savannah River into the Augusta Canal at the Augusta Diversion Dam (ADD), thus providing the opportunity for hydropower operations in the Canal. As part of FERC licensing, Augusta is attempting to balance water needs in the Canal and Augusta Shoals, considering the actively managed and regulated flow regime, multiple considerations, and increasing demands the on water resources of the Savannah River. Water diverted into the Augusta Canal bypasses the Augusta Shoals, an important habitat for aquatic life containing numerous rock outcrops, rapids, and small waterfalls.

Flow management and balancing water allocation among multiple users and needs is an important topic in Georgia currently and will have increased significance in the future as water demands increase. This paper is a status report of the Project to date and the issues that are yet to be resolved.

HYDROLOGIC CONDITIONS

The Savannah River and the Augusta Canal are the two primary waterways within the ACHP study area. The Savannah River at Augusta is highly regulated due to the influence of dams operated by the Savannah District of the U.S. Army Corps of Engineers (USACE) in the upper portion of the Savannah River basin (ENTRIX 2002a). The dams were constructed to supply flood control, recreation, and hydroelectric power and include the Thurmond, Russell and Hartwell Projects .

Large storage capacities, flood control operations, and release schedules designed to maximize hydroelectric production at these projects have substantially altered the flow regime of the Savannah River. Peak flows of the Savannah River, as measured at Augusta, have been reduced from historical pre-impoundment levels of 200,000 to 300,000 cubic feet per second (cfs) to existing maximum flows that rarely exceed 30,000 to 40,000 cfs (USACE 1996). The seasonal distribution of flows in the Savannah River has also been modified. Since the projects are operated to hold increased springtime runoff and release it more uniformly over the year, inflows exceed monthly average releases during the late winter and spring and releases during the summer and fall exceed inflows. Flows in the Savannah River downstream of the USACE projects are now more uniform on a seasonal basis, but vary widely on an hourly and daily basis.

Flows in the Savannah River at the ADD are determined primarily by the daily operations of the Thurmond Dam (Figure 1). Average daily flow releases from Thurmond Dam are planned on a weekly basis and are determined by reservoir levels, hydrologic forecasts, power generation needs, sales agreements, and other factors. Flow releases from the Thurmond Project are highly variable on an hourly basis because the project is operated primarily to supply electricity during peak demand periods. Releases from the Thurmond Project on an hourly basis can range from less than 100 cfs to just over 30,000 cfs, and there are typically one or two periods of generation per day on weekdays. Flows are further managed in relation to the USACE's declared drought status (USACE 2002).

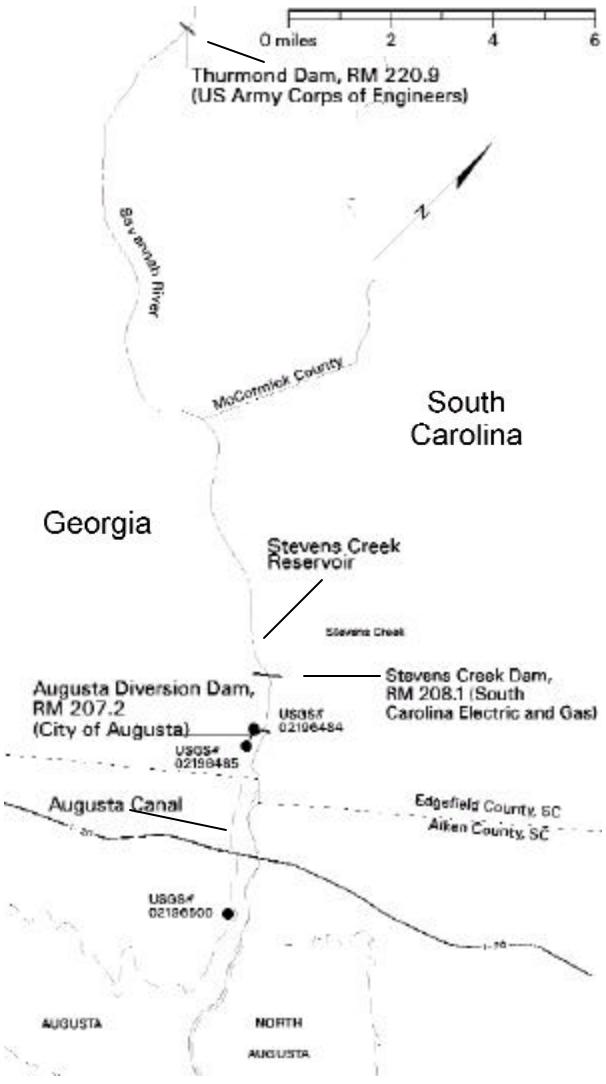

Figure 1. Augusta Canal Hydropower Project.

The highly variable flow releases from the Thurmond Project are re-regulated in part by the South Carolina Electric and Gas Stevens Creek Project located approximately one mile upstream of the ADD (Figure 1). The Stevens Creek project is operated to stabilize outflows in relation declared discharges at Thurmond Reservoir. The re-regulation of flow provided by the Stevens Creek Project contributes to the more uniform flows at the ADD.

Flows arriving at the ADD are further modified by diversion of water into the Augusta Canal. Water is returned to the Savannah River at various points along the length of the Canal, but the single largest return of water occurs at Augusta's Raw Water Pumping Station (RWPS). The free-flowing section of the Savannah River in the Canal bypass reach includes the 4.5-mile section from the ADD to a point approximately one mile downstream of the RWPS. This free-flowing section of the river is known as the Augusta Shoals.

BALANCING WATER NEEDS

There are multiple demands and needs for the water resources of the Savannah River that depend on the complicated flow regime described above. In the vicinity of the ACHP, these flow needs occur both in the Augusta Canal and in the Augusta Shoals. Recreation, passage for boats and canoes, and viewshed aesthetics are important considerations in both waterbodies.

In the Canal, Augusta withdraws raw water for municipal use and uses hydropower to pump the water to its water treatment facility. Additionally, three entities licensed separately by FERC use hydropower supplied by Augusta Canal flows to support industrial and commercial uses, supporting economic development and preserving jobs in the downtown area.

Flows adequate to support aquatic life are an important consideration in the Augusta Shoals. The Augusta Shoals is recognized by state and Federal agencies as a unique habitat important to the flora and fauna occurring there. The Augusta Shoals is home to a variety of species, including two Georgia state-endangered species: robust redhorse and rocky shoals spider lily (ENTRIX 2002b). Additionally, state and Federal resource agencies consider the Augusta Shoals to be important for the restoration of anadromous fish species such as American shad, and plan to expand fish passage and protect spawning habitats (ENTRIX 2002c).

EVALUATION PROCESS

Augusta has completed several resource studies and evaluations in support of their upcoming application for a license from FERC. These evaluations included analysis of Canal operations and water needs, fish passage and protection, protected species, and the Savannah River Instream Flow Study (SRIFS) (ENTRIX 2002d), among others. The studies were completed in consultation with state and federal resource agencies.

The SRIFS is a significant tool that is being used to estimate the potential effects of different flow regimes upon the instream habitat of the Augusta Shoals. A primary goal of the instream flow process is to determine flow levels to protect aquatic resources during periods of low flow, as have occurred in recent years due to persistent drought in the southeastern United States. The SRIFS analyses focused, in the context of historic stream flow analyses, on three main elements: recreational boat passage, fish passage, and habitat-flow relationships for resident and anadromous fishes.

The development of protective aquatic base flows for aquatic species in the Augusta Shoals is a microcosm of the larger balancing process undertaken by Augusta to include raw water and hydropower considerations. Development of protective aquatic base flows based on the results of the SRIFS require balancing of flow needs for target species (e.g., endangered species or target species for restoration) and non-target species and among life stages (e.g., adults and juveniles) of the same or different species. In some cases, high flow and low flow demanding species or life stages co-existed in the same time period. In those cases, the City is attempting to balance the relative importance of those species or life stages in the context of status, management goals and availability of habitats in the Savannah River adjacent to the Augusta Shoals.

NEXT STEPS

A protective aquatic base flow regime is currently being developed based on balancing of the biological considerations and needs for recreational boat passage. This flow regime will soon be submitted for review and consultation with state and Federal resource agencies after it is completed. Two aquatic base flow levels, primary and secondary, are being developed to correspond to the USACE's declared drought levels for planned flow releases at Thurmond Dam. Augusta also is evaluating the effect that these recommendations may have upon their raw water and hydropower operations, as well as the ability to deliver water to the three other hydropower entities located on the Augusta Canal.

Augusta is in the process of integrating these multiple factors into a Canal Operating Plan (ZEL 2003). It is anticipated that the Canal Operating Plan will provide the water management framework for the Project. The Canal Operating Plan will likely rely on the daily declared flows at Thurmond Dam considering the more stable flow pattern resulting from re-regulation at the Stevens Creek Project. It is anticipated that Augusta will then distribute protective flows to the Augusta Shoals and flows to the Augusta Canal with any balance of water also distributed to the Shoals. Computer models have been developed to examine the resulting flows, habitat levels, and impact on Canal flows and will be a part of the decision making process.

This project is an example of how a municipal government, acting as a good steward of its natural resources, is seeking to effectively balance multiple water demands in a highly managed river system.

ACKNOWLEDGEMENTS

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