KEY STEPS TO WATER ALLOCATION FORMULAS FOR THE A.C.T. AND A.C.F. RIVER BASINS

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Abstract: Since 1991 the states of Alabama, Florida, and Georgia have worked with the U.S. Army Corps of Engineers to develop a data base and the analytical tools which will allow them to allocate water from the Alabama, Coosa, Tallapoosa (ACT) and Apalachicola, Chattahoochee, Flint (ACF) basins in a way which will satisfy the needs of its citizens into the foreseeable future. After six years of effort and $16 million of federal and state expenditures, much remains to be done to meet this goal. Here are some of the key steps in finishing the process.

INTRODUCTION

Study Area. The ACT Basin rises in northwest Georgia and extends across east-central Alabama toward Mobile. Major cities include Rome and the northwestern Metro Atlanta Area in Georgia and Montgomery in Alabama. The rivers of the basin are heavily developed with reservoirs, including Carters Lake and Lake Allatoona in Georgia and Weiss Lake, Logan Martin Lake, and Lake Martin among many others in Alabama.

The ACF Basin also rises in northwest Georgia and extends south to Columbus, following the Georgia-Alabama line to Florida where it empties into Apalachicola Bay on the Gulf of Mexico. The Chattahoochee River is heavily developed in reservoirs, including Lake Lanier, West Point Lake, Walter F. George, and Lake Seminole; in contrast, the Flint and Apalachicola have no significant impoundments. Most of the city of Atlanta lies within the ACF Basin, near its headwaters. (See Figure 1 for the basin boundaries.)

Background. In 1990 the State of Alabama, concerned about the availability of water for its future needs, filed suit in U.S. District Court to prevent the Corps of Engineers from reallocating water from Lanier, Carters, and Allatoona to increase the water supply for Metro Atlanta; Florida joined this suit. Under a Letter of Agreement signed by the three states and the Corps, the ACT/ACF Comprehensive Study was initiated in 1991. As of February, 1997, Georgia and Alabama have passed two separate Interstate Compacts which establish the legal and functional basis for future management of the ACT and ACF in a manner which will seek to provide all three states with the water resources they need through the year 2050. Identical legislation will be submitted to the Florida legislature this spring. If passed by all three states, Congress will take up the matter later this year. However, the Compacts lack one important detail: the Water Allocation Formulas. These must be developed and agreed to by the states by December 31, 1998, or the Compacts will be dissolved. This paper addresses the key steps left in getting to these allocation agreements.

GETTING TO THE ALLOCATION FORMULAS

Although the Comprehensive Study has come a long way since 1991, it would be reasonable to say that the most difficult work lies ahead. The states must put the finishing touches on the data base and the models - the tools which required so much effort to develop - and use them to derive the allocation formulas. One view of the pathways left to be navigated is shown in Figure 2. This schematic consists of three linked processes and one key concept which are the subjects of this paper:

Key Processes:
- Models Testing and Approval
- Alternatives Evaluation
- Water Allocation Development

Key Concept:
- Stakeholder Participation

MODELS TESTING AND APPROVAL PROCESS

As of mid-February, 1997, the status of the analytical models which have been developed or modified for the ACT/ACF Study is as follows:

STELLA Model: This model is intended to provide a user-friendly method of simulating the effect of meeting various water demands and basin management options in a manner which sets priorities for satisfying these demands and computes measures of performance over the period of historical record being modeled. STELLA was developed as a monthly time step model for the ACT and ACF basins by the University of Washington. It is a tool for evaluating the tradeoff among demands for various operating rules, allowing rapid evaluation of a large number of alternatives under the water availability conditions represented by a 55 year period of historical hydrologic data (1939-1993).

Status: The model is operational and appears to provide accurate results; however, there are a number of technical

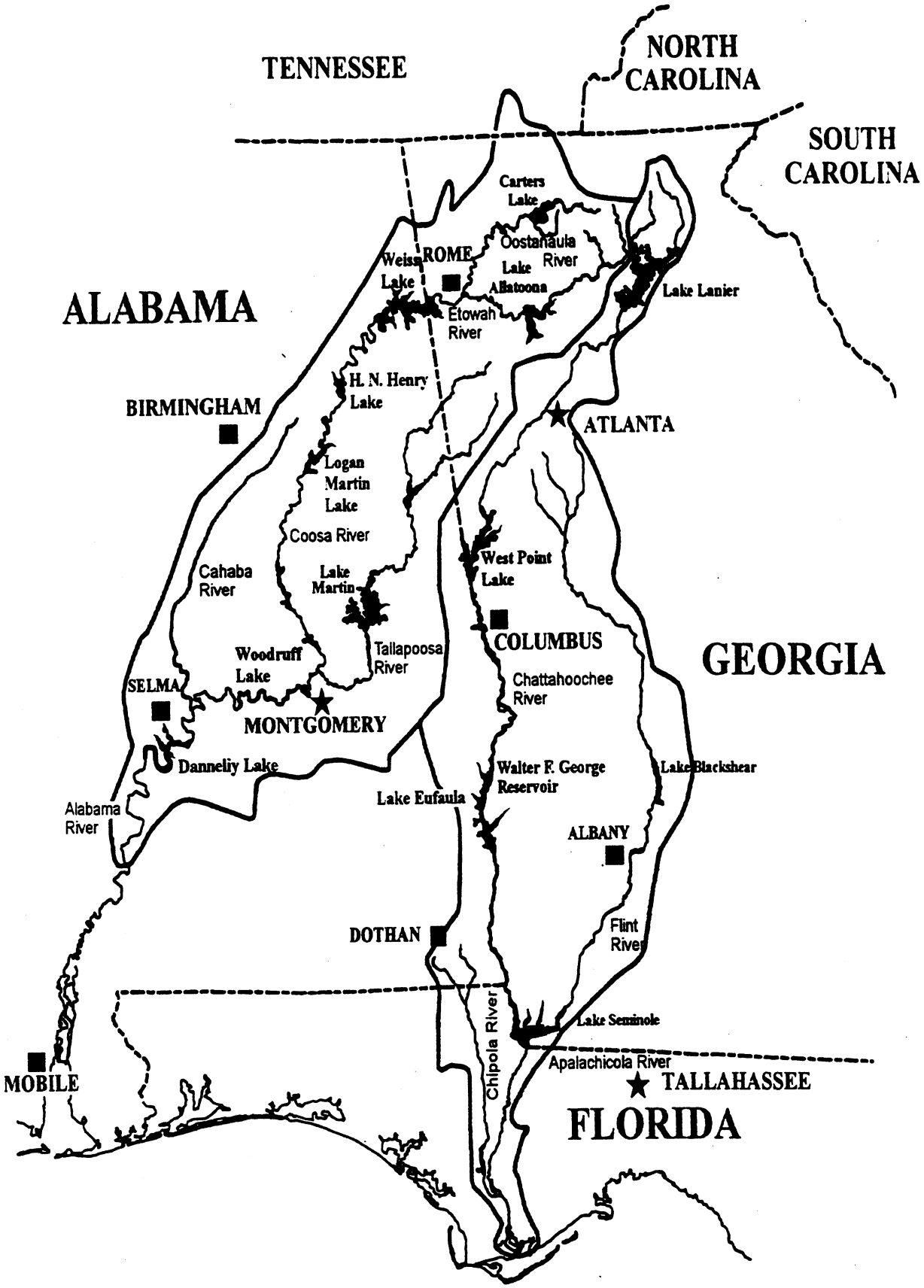

Figure 1. The Alabama-Coosa-Tallapoosa (ACT) and the Apalachicola-Chattahoochee-Flint (ACF) River Basins

revisions and organizational improvements which would further improve the model and make it easier to use. Currently, there is no contractor available to make model changes, however.

HEC-5 Model: This model was developed by the Corps of Engineers and is widely used to simulate reservoir operations. Several versions of this model have been developed by the Corps for the ACT and ACF basins using a daily time step. HEC-5 is regarded as inherently more accurate than STELLA, and certainly a more proven model which is, however, not as user friendly or as flexible as STELLA. The Study partners intend to use HEC-5 to check the STELLA simulations for similar alternatives and to provide more refined analyses of results for alternatives which look promising.

Status: The six HEC-5 models have been approved by the partners, although a revision is being made to the executable which affects some of the ACT Basin results.

HEC-5Q Model: HEC-5Q provides a one-dimensional estimate of water quality in reservoirs and stream segments in the basins, as determined from the HEC-5 hydrologic simulation and estimates of pollutant loadings.

Status: This model will be run in the spring of 1997 for selected HEC-5 alternatives and pollutant loadings which have been developed by the USEPA.

CE-QUAL-W2 Model: This model provides a 2-dimensional (longitudinal and vertical) simulation of water quality in Lake Weiss and Neely Henry in the ACT basin and in Walter F. George in the ACF Basin.

Status: CE-QUAL-W2 must be calibrated and run for selected alternatives once the HEC-5 models and demand data are approved for this activity. This work is expected to be completed by the summer of 1997.

PROSYM Model: The PROSYM model will be utilized by the North Pacific Division of the Corps of Engineers to compute the effect on firm energy and dependable capacity production for selected alternatives utilizing output from the HEC-5 model.

Status: This is an existing model which will be run for selected alternatives during the spring of 1997.

Model Testing

The process of testing and approving these models is scheduled for completion by June 30, 1997, although it is likely that some of the work will not be completed until the summer. The most critical step is considered to be the testing, or exercising, of the STELLA models to determine what additional changes are considered necessary before detailed evaluation of alternatives for the allocation formula development (Figure 2). This aspect of the process can benefit from Stakeholder input, especially those Stakeholders who have a good working knowledge of the STELLA Model. It is intended that the partners will utilize basin demand and management alternatives to assess how well the model is performing, meeting at least monthly to evaluate results and develop ideas for this testing process.

Another uncertainty in the models testing process which must be resolved is the development of demand input data for the HEC-5 models. Currently, these data are developed for any given alternative through the STELLA Model, which provides a great deal of flexibility in establishing and modifying demands (e.g., relationships between groundwater withdrawals and surface water impacts). A method must be developed which provides the same input demand flexibility for HEC-5 in order to simulate equivalent alternatives in both models.

ALTERNATIVES EVALUATION PROCESS

The reason it is so important to complete the model testing and approval process by the summer of 1997 is because the partners believe that the effort required to develop and approve an Allocation Formula for each of the basins will take a significant amount of time. The concept of joint partner meetings will be used to apply the models, especially STELLA and HEC-5, in evaluating alternatives which may provide promising concepts for satisfying the demands and meeting the objectives of more than one of the states. As shown in Figure 2, this process is expected to begin with using the STELLA model to screen alternatives, then with HEC-5 to model selected promising alternatives in order to confirm the results. This modeling effort will be carried out by staff from the three states. Very likely this portion of the modeling effort will often lead to dead ends, where alternatives show little or no promise for satisfying more than one partner's objectives. However, some alternatives will prove worthy of revision and further modeling and evaluation. The objective will be to identify concepts and alternatives which can become part of a data base for future consideration of Allocation Formulas. Some or all of these will also be analyzed for water quality and power impacts using HEC-5Q, CE-QUAL-W2,and PROSYM.

Stakeholder input will be critical to successful completion of the Alternatives Evaluation Process. In order for the states to properly evaluate how well a particular alternative satisfies its objectives, it is imperative that the Stakeholders communicate their ideas, preferences, and requirements for basin management and water resource utilization. Ideally, this also means that the stakeholders should understand the process and be able to interpret the results of model runs, especially the measures of performance (MOPs). Perhaps specific MOPs need to be created for some Stakeholders; perhaps creative methods are required to demonstrate the performance of a given alternative.. This means that considerable time and effort will need to be spent by the partners and the stakeholders to develop this level of knowledge and understanding.

WATER ALLOCATION DEVELOPMENT PROCESS

Finally, the data base developed during the alternatives evaluation process will be considered by the states in developing the Allocation Formula. Although the date for initiating the formal water allocation process has not been established, it must be completed by December 31, 1998. The formula will not be solely

based on model results, but it is expected that additional modeling will be done to test allocation ideas or to explore the effect of various options.

In addition to the determination of how much water each of the partners will need, there will be a variety of possible methods for constructing and applying a formula, for accounting for uncertainty in demand projections, water availability, etc. Will there be a single minimum flow established at a state line? Will the allocation be expressed as a percentage of available water? How will water availability be defined, or measured? Will there be a procedure for altering the formula periodically if demand growth occurs at different rates than projected?

This is perhaps the most critical time for Stakeholder input to the process. It is likely that frequent meetings will be held within each state to inform Stakeholders, including federal agency staff, of the evolution of a formula. Certainly, enough time must be set aside, several months, for each state to thoroughly disseminate any tentative formula to all interested parties and for discussion and evaluation of the potential advantages and risks of the formula.

SUMMARY

Much remains to be done to reach an agreement on Allocation Formulas for the ACT and ACF basins. The next 18 to 21 months will require the cooperative efforts of many people. The active participation of the Stakeholders from each of the three states and from the federal government will help make sure that all significant concerns are addressed appropriately in any proposed Allocation Formula.

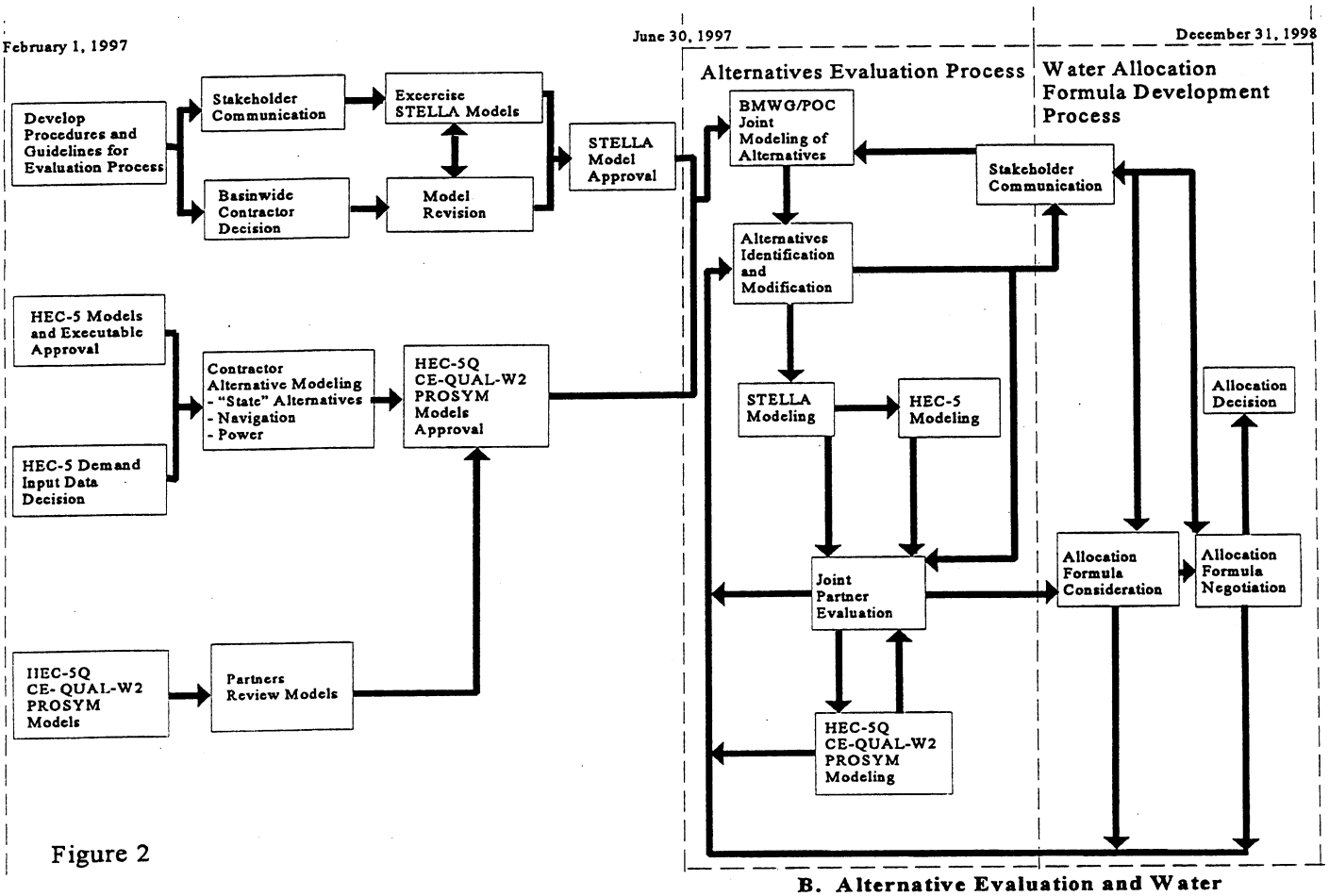

Figure 2

A. Model Testing and Approval Process

B. Alternative Evaluation and Water Allocation FormulaDevelopment Process