5. Flow Regime Determination

5.1 General Procedures

Given the need for instream flow protection against low-flow extremes, flow regimes determined for purposes of surface water availability assessment primarily constrain water availability during prevailing drought (as opposed to normal or wet) conditions.

Flow regimes are determined for planning nodes on regulated, i.e., immediately downstream of storage reservoirs, semi-regulated i.e. further downstream but still impacted by storage reservoirs, and unregulated river reaches, with no storage reservoirs upstream. Run-of-river reservoirs are not considered to constitute a regulated reach. There are two methods for determining flow regimes; one method is for unregulated streams, and the second method is for regulated streams and semi-regulated streams.

For unregulated streams, flow regimes are determined by a composite time series from monthly 7Q10s (seven-day, ten-year recurrence intervals) and daily unimpaired flows. The unregulated regime is the monthly 7Q10 for each day of the month, except for those days on which the unimpaired flows drop below the monthly 7Q10. For these days, the unimpaired flow value is the regime value, as illustrated on Figures 5-1 through 5-4.

For regulated and semi-regulated nodes, water availability is determined by compliance with a select set of criteria. These criteria are: average demand shortage, average at-site flow requirement shortfall, minimum reservoir storage (shown both in terms of volume and percent of storage), and average basinwide flow requirement shortfall. The average at-site flow requirements, if present, are determined as described above for regimes at regulated and semi-regulated node flow. These inferences are predicated on the assumption that federal and non-federal reservoirs are operated in accordance with existing federal policy or Federal Energy Regulatory Commission (FERC) license requirements, respectively.

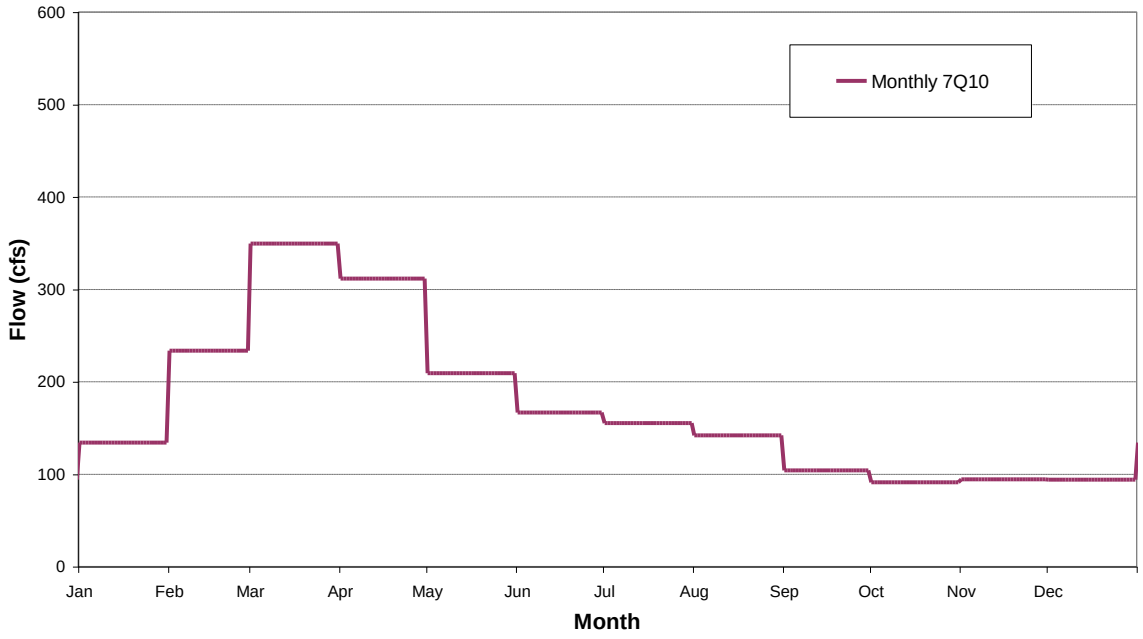

Figure 5-1 Monthly 7Q10

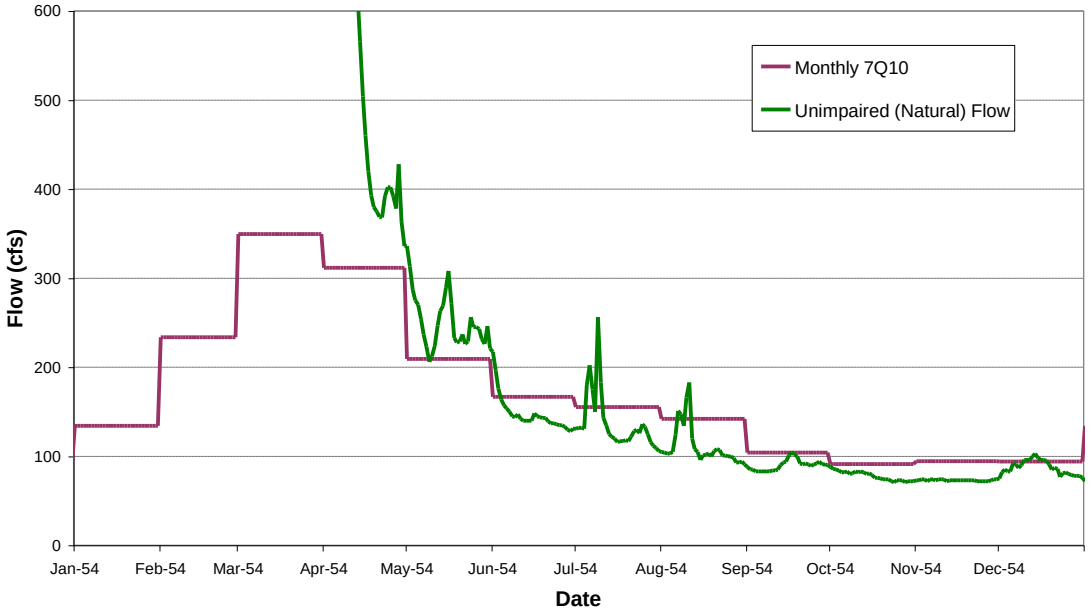

Figure 5-2 Unimpaired Flows Superimposed on Monthly 7Q10

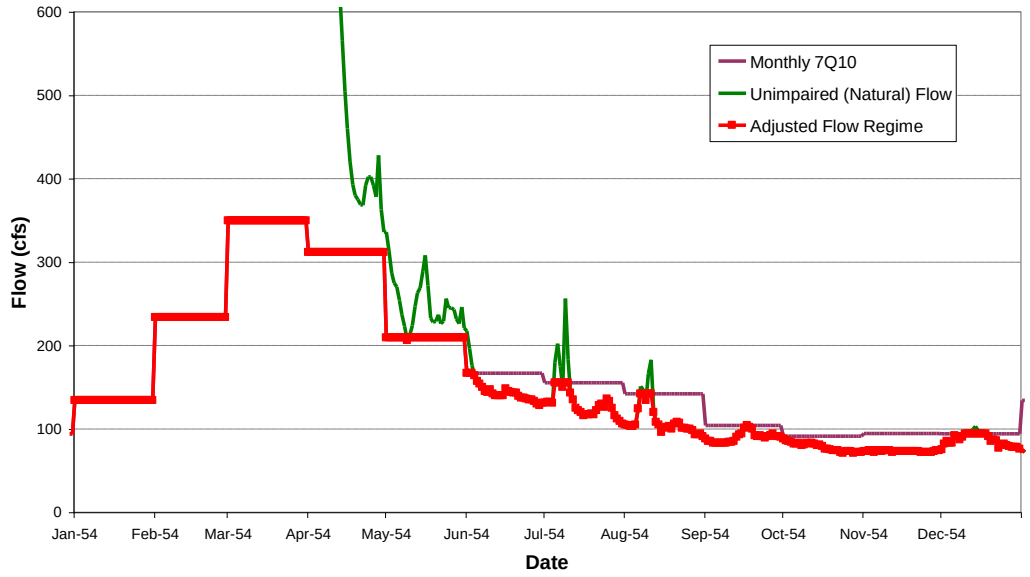

Figure 5-3 Flow Regime Adjusted by Unimpaired Flows (Lesser of Monthly 7Q10 or Unimpaired Flow)

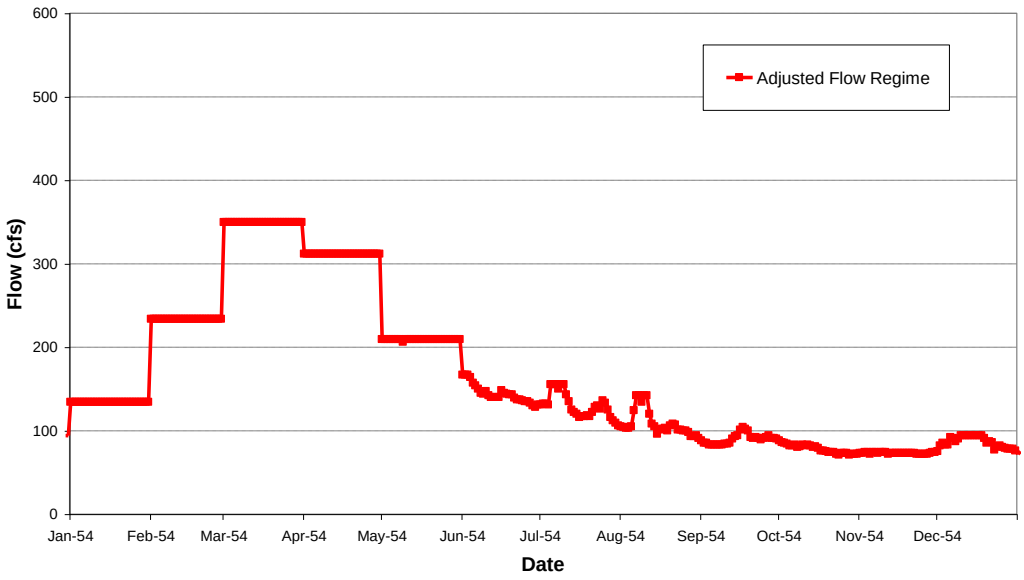

Figure 5-4 Adjusted Flow Regime

5.2 Interim Instream Flow Protection Policy

Georgia Department of Natural Resources (DNR) Rule 391-3-6-.07 (4)(b) 9 (iii) (II) authorizes Georgia EPD to require instream flow protection for certain surface water withdrawal permits. Further information on the rule can be found on the EPD website (http://www.gaepd.org/Documents/rules_exist.html) and the interim policy under http://www.gaepd.org/Files_PDF/gaenviron/ wateriss_wp.pdf.

5.3 Flow Regulation by Federal Reservoirs

Input to the River Basin Planning Tool (RBPT) included releases from the federal reservoirs in the ACT, ACF, and SO study basins, determined by operational simulation using the HEC-5 (Simulation of Conservation and Flood Control Systems) reservoir system model. HEC-5 is primarily intended to assist in planning studies for design and allocating storage in proposed reservoirs, for reallocating storage in existing reservoirs, and for formulating and evaluating water control plans with respect to a variety of operating objectives and constraints. Reservoirs may be considered individually or as components of reservoir systems. The model achieves these objectives by sequential simulation of the operation of reservoirs.

Operational simulation of the federal reservoirs in these study basins was performed for the 1939–2007 unimpaired flow period of record. Input to the HEC-5 models included unimpaired incremental flow, net evaporation, and net reach water withdrawal time series data; reservoir physical data (e.g., elevation-area-storage curves, spillway and outlet works rating curves, turbine/generator performance data, tailwater rating curves, etc.); and operating rules and constraints including maximum and minimum flows, firm power requirements, and seasonal rule curves. As a practical matter, operating rules change over time as water control manuals are updated or in response to changing demands and/or instream flow requirements. Because all of the federal reservoirs considered in the current water use assessment have physical storage sufficient to meet present water demands, it was not necessary to precisely capture current operating rules so long as none would have completely drained conservation storage during historical droughts. However, to make the RBPT simulations as realistic as possible, the U.S. Army Corps of Engineers' most current management practices, or operating rules, were input to the models, briefly summarized as follows:

- ACT Basin: Carters and Allatoona operated in accordance with the Alabama-Coosa River Basin Water Control Manual, March 1952, revised December 1993; "Existing Conditions" HEC-5 platform model TEA08017 applied with current water demands and 1939–2007 merged unimpaired flows developed as described in Section 4.

- ACF Basin: Lanier, West Point, W.F. George, and Jim Woodruff reservoirs operated in accordance with the Concept 6 Revised Interim Operations Plan (RIOP), implemented in June 2008, current water demands, and 1939–2007 merged unimpaired flows developed as described in Section 4.

- SO Basin: Hartwell, Richard B. Russell, and J. Strom Thurmond reservoirs operated in accordance with the Savannah River Basin Drought Contingency Plan Update, May 2006, amended by the Fall/Winter Flow Reduction, September 2009.

Because of the availability of continuous daily historical release data dating back to project construction (early 1940s), operational simulation was not necessary for the Tennessee Valley Authority's (TVA's) Blue Ridge, Chatuge, and Nottely reservoirs in the TN study basin.

5.4 Flow Regulation by Non-Federal Reservoirs

With the notable exception of Keowee in the SO study basin, most of the other private power reservoirs in the SO and other study basins are operated by Georgia Power Company. No operational simulations were performed for the private power storage reservoirs, and RBPT flow regimes were consequently based on monthly 7Q10 cumulative unimpaired flows. Reservoirs with significant storage were combined by sub-basin

to form a composite storage reservoir. An example is the composite Lake Oconee/Sinclair reservoir located in the OOA Milledgeville planning reach.

5.5 Run-of-River Reservoirs

By definition, no flow regulation is assumed to occur downstream of run-of-river reservoirs, whether federal or non-federal. As a consequence, reach type designation (regulated or unregulated) is unaltered by the presence of upstream run-of-river reservoirs. Examples of run-of-river reservoirs are Morgan Falls (non-federal, upstream of Atlanta), Georgia Power reservoirs between West Point (federal) Reservoir and Columbus, and New Savannah Bluff Lock and Dam (federal, upstream of Augusta).