Streamflow Separation to Estimate Daily Unregulated Streamflow of Ungauged Watersheds in the Coastal Plains of Southeastern United States

Ssegane[1], H., D. M. Amatya[2], E. W. Tollner[3], and J.E. Nettles[4]

AUTHORS: [1,2] Postdoctoral Research Scientist, University of Georgia, Driftmier Engineering Center, Athens, GA 30602, USA, [2]Research Hydrologist, USDA-FS, [3]Professor and Graduate Coordinator, College of Engineering at University of Georgia, [4]Research Hydrologist, Weyerhaeuser Company

EXTENDED ABSTRACT: 2012 South Carolina Water Resources Conference, held October 10-11, 2012 at the Columbia Metropolitan Convention Center

ABSTRACT. Long-term daily streamflow is relevant in assessment of water availability, quantifying and managing water quality (e.g. Total Maximum Daily Load), watershed restoration, and in prediction of occurrences of hydrologic extremes such as floods and drought. Use of regionalized hydrological model parameters, where physical characteristics of ungauged watersheds are related to same parameters for gauged watersheds is a standard practice. The above approach implicitly predicts streamflow magnitude and temporal sequence concurrently. An alternative approach that has not been fully explored is the conceptualization of streamflow as a composite of two separable components of magnitude and sequence, where each component can be estimated separately and then combined. The magnitude can be modeled using the flow duration curve (FDC), which probably represents all flow magnitudes experienced by the watershed for the period under consideration, whereas the sequence defines the timing or temporal occurrence of the magnitudes contained in the FDC. This approach is referred to as the streamflow separation (SFS) method. The main assumption behind the approach is the transferability of hydrological information across watersheds in the same physiographical region. This study tests the applicability of SFS on watersheds of Southeastern Coastal Plains with significant levels of surface storage (wetlands), where gauged watersheds are generally limited. A 19 point regionalized FDC is developed to estimate streamflow magnitude using a greedy-heuristic search algorithm and watershed characteristics. Sequence is predicted by transferring the temporal sequence of neighboring gauged (donor) to the ungauged (target) watersheds. The performance of the method is validated by estimating daily and monthly streamflows of Black River at Kingstree, SC (02136000) and Coosawhatchie River, S.C (02176500). Also, validation results for Trent River near Trenton, NC (02092500) and Satilla River near Waycross, GA (02226500) are presented.