TESTING RESILIENCY OF HYDROLOGIC DYNAMICS OF A PAIRED FORESTED WATERSHED AFTER A HURRICANE IN ATLANTIC COASTAL PLAIN USING LONG-TERM DATA

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Hurricanes are infrequent but influential disruptors of ecosystem processes, including streamflow and evapotranspiration dynamics in the southeastern Atlantic and Gulf coasts. However, literature on hurricane effects on long-term streamflow dynamics is lacking in this highly urbanizing region characterized by a poorly drained low-gradient forested landscape. Furthermore, the validity of paired watershed approach, often used for quantifying effects of land management and land use change on streamflow dynamics, is still poorly understood for systems dramatically impacted by the hurricanes. In this long-term study on a paired 1st order forested watershed system within the Santee Experimental Forest, South Carolina impacted by Hurricane Hugo in 1989, we used streamflow data from10 year (1969-1978) for a pre-hurricane (pre-Hugo) period and the most recent 10 years after forest regeneration (2004-2013) (post-Hugo period) to examine the effects of the hurricane on paired relationships of streamflow dynamics using hydrograph characteristics and the flow frequency duration patterns for extreme high and low flows. We tested the hypothesis that the post-Hugo paired watershed relationships between the treatment and the control (both with regenerated forests since Hugo) for mean storm event hydrograph characteristics (i.e. stormflow volume, peak flow rate, time to peak, and runoff coefficients) are not significantly different from the pre-Hugo ones, indicating both the resiliency of these coastal forests to the extreme hurricane events and the paired approach. We also examined the relationships of the same hydrograph characteristics between the control and treatment watersheds observed during the pre-hurricane annual partial prescribed burning treatment period (1976-81) and the post-Hugo treatments of whole tree thinning and burning conducted during 2006-11 for difference in the treatment effects. These results have strong implications in using long-term data as a baseline reference as well as for applications of the paired watershed approach on this and similar other coastal forest systems for assessing land use/land cover change and management impacts.

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