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Present and Future Apalachicola River Flow Study Using Wash 2D Numerical Model

PRESENT AND FUTURE APALACHICOLA RIVER FLOW STUDY USING WASH2D NUMERICAL MODEL

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One of the most effective tools for water resources planning and studying coastal ecosystem dynamics is simulating river flow under various scenarios. These scenarios may represent proposed anthropogenic changes to the basin such as construction projects or anticipated natural changes such as sea level rise. In this study, a hydrologic model for the Apalachicola River basin is developed to investigate the potential changes in the flow characteristics. This river was affected by dams and human water use in the past (Gibson, et al., 2005). Climate change affecting the hydrologic water cycle and in turn impacting water resources is a major concern (Milly, et al., 2008).

The Apalachicola River as shown in Figure 1 is formed by the conflux of Chattahoochee and Flint Rivers and it has the largest discharge in Florida (Iseri and Langbein, 1974). This river is the home for a variety of species. Altered water levels in future scenarios could cause disconnection between channel and floodplain and decrease in habitat areas (Gibson, et al., 2005).

Assessment of extreme rainfall events under climate change scenarios in the river basin using rainfall intensity-duration-frequency (IDF) curves is carried out using the WASH2D numerical model. This model is derived from WASH123D, which can model surface flow in a watershed system using three approaches: kinematic, diffusive, and dynamic wave models (Yeh, et al., 1998). A two dimensional mesh for the Apalachicola River basin with defined boundaries applying the rainfall storm scenarios was developed. The primary driving force for this simulation is varied design storms derived from IDF curves (Wang, et al., 2011). These design storms are applied to the assigned nodes and WASH2D solves 2-dimensional overland flow equations by applying finite element methods in the region. These simulation results are used to predict the response of the river to various storms. Then, predicted future IDF curves derived from the North American Regional Climate Change Assessment Program data were implemented to forecast future river flow.

Estimated flows are in agreement with observations in the Apalachicola River. Several methods within the WASH2D model were applied to validate the simulation. Grid independency test was also demonstrated using different element sizes in order to study the sensitivity of the model to grid resolution. Results from the WASH2D numerical model using future IDF curves were examined to gain insight into the flow and watershed response to potential future storms.

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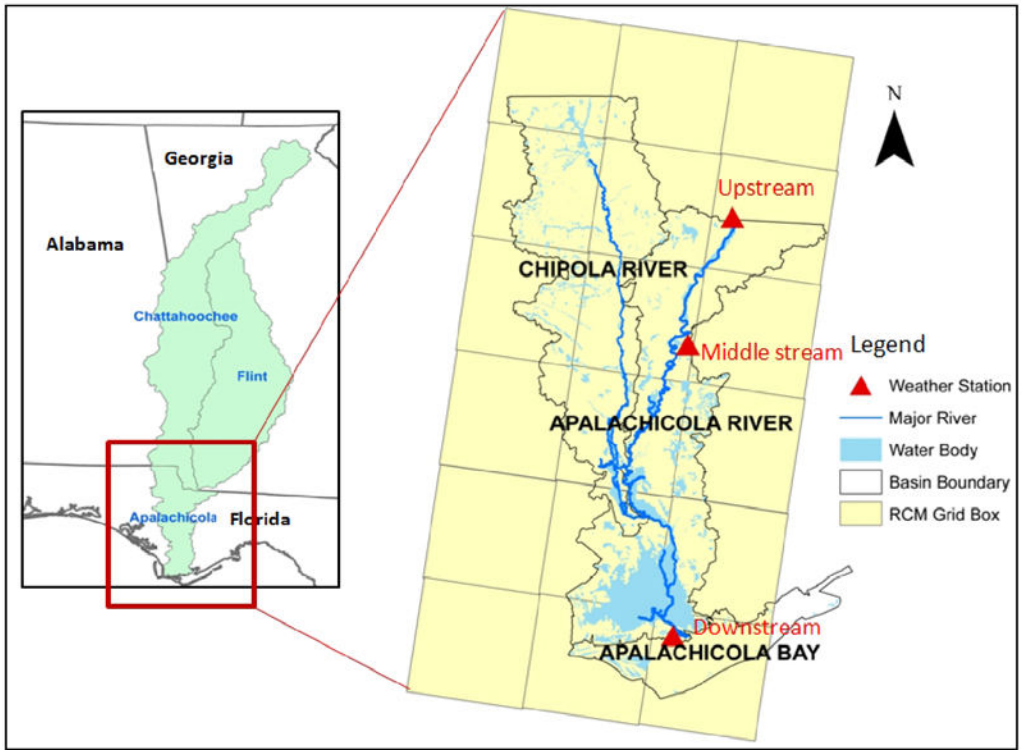

Figure 1 Apalachicola–Chattahoochee–Flint River basin (Wang, *et al.*, 2011)

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