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Improved simulation of riparian wetland processes using SWAT+

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Riparian wetlands play a key role in the hydrological and nutrient regulation of rivers basins and are hence important features for river basin management. But, most catchment simulation tools are not able to simulate the hydrological and nutrient processes in wetlands. One important reason is that the catchment models are not properly representing the connectivity and the interactions of the wetland with the surrounding catchment and river system.

SWAT+ is a new version of SWAT that allows for more flexibility to represent interconnectivity of different types of landscape elements while building SWAT models. SWAT+ has an object-oriented structure, with specific variable definitions and set of processes for each object. Objects can be Hydrological Landscape Units (HRU's), landscape units (cluster of HRU's), channels, groundwater bodies, reservoirs on rivers and reservoirs on landscape (eg. wetlands, ponds, potholes). Objects are linked to each other with a high number of flexibility. The SWAT+ version makes it easy to interconnect the floodplains and riparian wetlands with upland areas, groundwater resources and rivers.

In this study, we used SWAT+ to connect the riparian wetland zones with rivers and upland areas. We developed and tested new routines for the 'reservoir-in-landscape' for the simulation of riverine overland flooding processes with an application to the Little River Experimental Watershed (LREW), a 334 km2 large watershed located in the Upper Suwannee River Basin in Georgia. The LREW is characterized by broad floodplains and gently sloping uplands. Elevations range from 82 to 148 m m.s.l. The hydrologic behavior of the watershed is strongly affected by the storage capability of the channel alluvium.

The simulation results show that the inclusion of riparian wetland processes influences the hydrology of the landscape and the river. The riparian HRU's are typically wetter when interacting with wetland reservoirs resulting in higher runoff and seepage. The river flow is reduced for the higher peak values.