

**ASSESSMENT OF TEMPORAL AND SPATIAL EFFECTS OF LAND USE
CHANGES ON WETLAND HYDROLOGY: A CASE STUDY FROM SOUTH
AFRICA**

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Since wetlands respond very sensitive to changes within ecosystems, integrated analyses and modeling of their process dynamics as well as their interaction with other hydrologic and ecological landscape components provide valuable information for an impact assessment. Therefore, a multidisciplinary project was initiated to model landscape dynamics and their temporal and spatial effects on wetlands in the headwaters of the semi-arid Umzimvubu basin, South Africa. The analysis of hydrological, geochemical and bio-ecological time series derived from 8-years monitoring, soil and terrain features as well as physical-based model approaches (HYDRUS-2D, HILLS9, MMS/PRMS, 3-PG) have been integrated to identify dominant mechanisms of water flow into and through wetland bodies. It was shown that hydrodynamics of smaller wetlands are mainly controlled by recharge mechanisms, while larger valley bottom wetlands are driven by interlinked ground-/surface water dynamics, discharge/recharge processes and direct rainfall input. Based on model coupling, an integrated landscape model approach has been developed to simulate several land use scenarios and to evaluate their temporal and spatial effects on wetland hydrodynamics within a landscape perspective. Model simulations indicate that wetland dynamics and their landscape functions will be influenced by significant land use changes such as afforestation directly in terms of altered recharge/discharge mechanisms, reduced base flows addressed to increased interception losses as well as reduced water retention capability as a result of net loss of wetland area. In addition, such changes will affect environmental functions and biodiversity due to habitat loss and alterations. The study also reveals that these impacts are strongly associated to size and type of the wetland and its management.