An overview of the implementation of macrophytes as ecosystem engineers in hydrological modelling.

D. Meire and P. Troch

Ghent University, Department of Civil Engineering, Ghent, Belgium (dieter.meire@ugent.be)

Waterplants or macrophytes are for a long time overlooked in hydrologic and geomorphologic studies of lowland rivers. Nevertheless, they have an important influence on the water flow, sedimentation processes and nutrient dynamics in such systems (Clarke, 2002; Franklin et al., 2008). As such, according to the terminology of Jones et al. (1994), namely "Organisms act as engineers when they modulate the supply of resource or resources other than themselves", macrophytes are ecosystem engineers.

Macrophytes form an obstruction for the water flow which results in an increased flow resistance and thus increased water levels (Green, 2006). Because the presence of macrophytes in a river shows a large variation throughout the year, also the resistance due to vegetation varies (De Doncker et al., 2007, 2008). Besides the temporal variation, also the spatial configuration of the macrophytes in the river plays an important role. Due to patch formation, areas of higher (between the patches) and smaller (in the patches) flow velocities occur (Green, 2006), resulting in flow heterogeneity (with important transverse flow components). This variation of stream velocities in and between patches results in definite sedimentation and erosion zones, and as such shapes the morphology of rivers. The magnitude of the effects described above, is largely influenced by the characteristics of the macrophytes itself (emergent or submerged, density, flexibility,...)

To in-depth investigate the importance and influence of macrophytes as ecosystem engineers, hydrological or (coupled) ecosystem models can be used. To account for waterplants in such models, a framework which can handle the threefold variation of macrophytes (composition, time variation and spatial variation) is necessary. An overview of current frameworks which are formulated, based on experimental research, and their implementation in models is given.