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RIFOD - a spatially-explicit riparian forest dynamics model for Central European conditions: Application at the River Rhone, Switzerland

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Riparian systems dynamics and complexity may explain why a coupled model approach of dominant driving-processes ($e.g.$ ecological, hydraulic, geomorphological processes) is not yet available at the desired temporal and spatial scales. Existing process-based models of riparian forest dynamics simulation lack of processes important for alpine river systems, like nutrient scarcity, mechanical disturbance or drought stress. Furthermore, they do not cover integrally the main responsible biotic and abiotic factors implicated in species response to flooding.

Herein, we present of a process-based, spatially explicit model, coupling ecological and hydraulic processes to simulate riparian forest dynamics for Central European conditions. The model RIFOD ('RIparian FOrest Dynamics') is a distribution-based forest succession model coupled to a quasi-2D hydraulic model, which simulates short or long-term riparian forest dynamics at a yearly time step. The model, applied on a 10 times 10 m mesh grid, is spatially-explicit concerning the interactions of the ecological and hydraulic processes and integrates 65 Central European tree and shrub species. RIFOD is based on developments of existing upland forest succession models, which at the process level were improved, adapted and completed according to the ecological gradients observed in riparian areas ($e.g.$ flooding, nutrients, moisture). The model finds its application in riparian areas in which the geomorphological activity of the river is not a dominant process or in case of restoration projects, for widened fluvial corridors with geomorphologically stable stream channels. Model application is illus-

trated at the case of a large river restoration project in Switzerland – the 3^{rd}Rhone Correction Project. Difficulties faced in parameterization and validation of the model are also discussed.

Simulation of riparian forest dynamics under different hydraulic conditions can be a helpful tool in the decision-making process of large river restoration projects (or the planning of retention basins). Moreover, it allows a better understanding of the riparian system and its driving-processes.