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A hierarchical approach linking hydraulic and ecological modeling for habitat predictions for riverine pioneer vegetation

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The distribution of sessile riparian plant species and their habitats along riverways are highly dependent on river dynamics and connectivity. River restoration and conservation of riparian plant species rely on expert knowledge and more recently also on modelling approaches to predict species' occurrence. Ecological modelling on habitat suitability for terrestrial species is usually based on climatic and topographic features, whilst river hydrodynamics is rarely considered.

Our study aims at predicting suitable habitat for a characteristic pioneer species for dynamic riverine habitats, the German Tamarisk (*Myricaria germanica*). Habitat predictions are tested in a case study on a floodplain along Moesa river in canton Grisons in South-East Switzerland. We link two modeling approaches having two different spatial scales using a hierarchical process. First, we define a large-scale habitat suitability matrix based on climatic, geological and topographic predictors. Using a two-dimensional hydrodynamic model, inundation frequency maps and flood level maps for several significant months for German Tamarisk establishment are constructed, to further refine the niche for the riparian plant.

The predicted habitat suitability is evaluated with species presence data for both adult and offspring plants. Our results allow gaining insights into the importance of linking ecological and hydraulic models having different spatial and temporal scales, for more refined predictions of riparian species distribution.