

A spatial planning instrument for restoring estuarine low marshes

Maike Heuner, Arnd Weber and Uwe Schröder

Federal Institute of Hydrology, Ecological Interaction, Am Mainzer Tor 1 56068 Koblenz, Germany
E-mail: heuner@bafg.de

To improve the ecological conditions in the navigable Elbe estuary, the Waterway and Shipping Board Hamburg plans to remove technical bank protection on the island of Lühesand. An area with steep slopes between mean low and mean high water and protected by riprap should be modified to a natural bank with gentle slopes. Using data from natural reference sites, we set up species distribution models for the emergent macrophytes *Schoenoplectus tabernaemontani*, *Bolboschoenus maritimus*, and *Phragmites australis*. Based on the models, we conducted spatial simulations to identify the most appropriate site with the best habitat suitabilities and the lowest work effort.

The key predictors for the habitat suitability of these macrophytes species were 'elevation relative to mean high water', 'mean bank slope', and 'length of bottom friction' from shallow water up to the vegetation belt as variable representing hydrodynamic stress. Based on the slope of the reference sites, the modifications of the slope were simulated to create virtual elevation models. Using these and the present elevation model, the species' habitat suitabilities were calculated. Finally, present and simulated situations were compared by habitat suitability, area of tidal flats, and volume of ground material. The simulations showed a decrease in bank slope and an increase in tidal flats and habitat suitability. We infer that the ecological conditions for emergent macrophytes will improve. They can act as natural bank protection, because plants of low marsh attenuate waves. Thus, natural habitats for other flora and fauna species will be provided. Our developed method can serve as a crucial spatial planning instrument for restoring low marshes along estuarine shorelines