



Model tests of living brush mattresses made of shrub and tree willows as bank protection at navigable waters

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The embankment stability at navigable waters suffers from hydraulic loads, like strong ship induced waves, resulting hydropeaking and strong water-level fluctuations. Willow brush mattresses can reduce erosion at the embankments of rivers and increase bank stability.

Due to experiences gained in the project "Alternative Technical-Biological Bank Protection on Inland Waterways" the Federal Waterways Engineering and Research Institute commissioned a more detailed investigation of protective functions of willow brush mattresses respectively the differences between brush mattresses made of pure shrub (*Salix viminalis*) or tree willows (*Salix alba*) at water ways with high ship-induced hydraulic loads.

This paper shows the upcoming research methods of the years 2014 to 2016. The protective functions of two different willow brush mattresses and the congruence between soil, hydraulics and willow sprouts movement will be investigated in a wave basin by measuring flow velocity with ADVs (Acoustic Doppler Velocimeters) installed near the soil surface and in different embankment areas, the pore water pressure with probes in different soil layers, the wave height with ultrasound probes and the willow movements with permanently installed cameras while flooding the basin as well as measuring the erosion afterwards. These flooding test series will be conducted two times during the vegetation period.

The shear strength of the tree willow rooted soil will be examined in different soil layers with a shear load frame. The results will be compared with the data of shear strength tests of same aged brush mattresses made of shrub willows, which have already been carried out by the Federal Waterways Engineering and Research Institute.

The filtering capability of the soil covering branches and the near surface willow roots will be investigated by growing willow brush mattresses in sample boxes. Those can be repeatedly moved up and down into a diving pool while measuring pore water pressure in different soil layers and flow velocity with ADVs.