THE EFFECT OF HERBACEOUS PLANT ROOT CHARACTERISTICS ON HYDRAULIC STREAM BANK EROSION

A CASE STUDY FOR THE RIPARIAN ZONE OF THE RIVER DINKEL

Stream bank erosion can be can be a large environmental problem, with large ecological and societal consequences. Nowadays, many stream restoration projects use ecological engineering to cope with this problem. Herein riparian vegetation is often used to increase bank stability and reduce erosion. The resulting reduction of hydraulic erosion is mainly attributed to reduction in near-bed flow by the aboveground vegetation properties and the increased bank stability as a result of the greater strength of root permeated soils. This greater strength of root permeated soils might contribute to the hydraulic erosion reduction. However, it is not fully known to what extent this increased strength contributes to the reduction of hydraulic erosion and which root permeated soil properties are important for this contribution.

In order to improve the understanding and quantification of the effects of the roots of riparian vegetation on the erosion of vegetated stream banks, this research studies the effects of several root characteristics on soil shear strength and hydraulic erosion, specifically for species in the riparian zone of the river Dinkel stream bank. The studied species in this research were the *Leersia oryzoides*, *Rumex obtusifolius* and *Digitaria sanguinalis*. The considered root characteristics are the wet weight of the root system, the dry weight of the root system, the root diameter and the number of roots. The shear strength of the (un)vegetated soil was determined by the in-situ shear vane test and the laboratory direct shear test (Figure 1). The erodibility of the (un)vegetated soil was then estimated with flume experiments at the NIOZ research institute (Figure 2). For the flume experiments and direct shear test (vegetated and unvegetated) soil samples were extracted from the riparian zone of the river Dinkel. For each of these samples the root characteristics were determined and the shear strength was measured with the shear vane test.

In general, the studied root characteristics showed a weak correlation with the soil strength and erosion rate. The measured root characteristics, shear strengths and erosion rates showed large differences on small (cm to m) spatial scales on the Dinkel bank. Although the different species had quite some differences in root characteristics, the shear strengths and erosion rates of their root permeated soils did not deviate considerably from each other. However, the shear strength itself showed to be related to the erosion rate, as a moderately strong, statistically significant negative correlation was observed between the two.

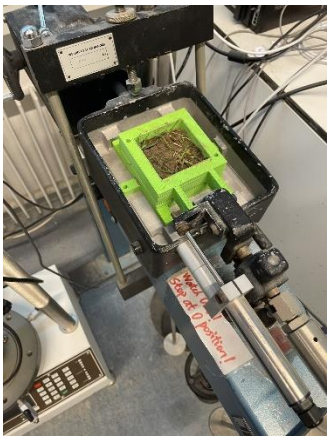

Figure 1: Direct shear test apparatus with vegetated sample

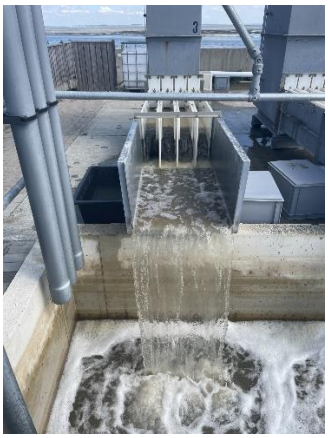

Figure 2: Fast Flow Flume at the NIOZ research institute

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