

Erosion characteristics in a shallow water area covered with rigid emergent macrophytes

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In recent years, riparian zones by riverside have been remediated by revegetation for the purpose of erosion control, rather than by engineering measures such as concrete revetment. Therefore, it is essential to understand the reaction to shallow water scouring of rigid emergent macrophytes and fitness of the plants in riparian zones. In the past, artificial materials such as acrylic cylinders were mostly used as surrogate plants. However, such materials could neither simulate the protecting function provided by the root system against scouring, nor test the survival rate of plants during floods. In this study, we selected four true emergent macrophytes and planted them in a regular array in a recirculating flume for scouring experiments. Each plant was cultivated in the flume under the low-discharge condition in the first month in order to make its root system develop in the soil. Then we increased the discharge gradually for every two weeks during the following two months. Before the discharge was increased each time, the topographic change and erosion amount through the planted- and unplanted-areas were obtained by the laser scanning leaf topography method and the image analysis technique. The growing conditions of the macrophytes were also recorded weekly. From the results, we found that scouring occurred in the channels among stems of macrophytes, and the sediments mostly accumulated around and behind the stems in the planted-area. The phenomenon seemed different from cylinder simulations in the literature, whose results pointed that the flow around a cylinder would cause deep scours while channels between any two cylinders should be accumulation zones at low discharge.

Keywords: rigid emergent macrophytes, scouring experiments