Linking riparian woody communities and fluviomorphological characteristics in a regulated gravel-bed river (Piave River, Northern Italy)

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Abstract

Gravel-bed rivers featuring a near dynamic equilibrium state usually display a good correspondence between geomorphological and riparian community gradients, whereas long-term human alterations may disrupt these patterns. The aim of this study was to investigate the distribution of woody riparian vegetation on three geomorphic units – floodplains, bars, and islands along the Piave River, a gravel-bed river located in Northern Italy suffering from various degrees of human pressure and disturbances. A total of 214 plots (4 × 4 m) along three cross sections in each of two sub-reaches of the river were surveyed in order to identify the different morphological units, dendrological characteristics of standing plants, and species composition. Three riparian woody communities, with decreasing woody species richness and tree size, were identified by cluster analysis: Alnion incanae (n = 58), Salicion eleagni (n = 52), and Rhamno-Prunetea (n = 27). The first was significantly associated with floodplains and the others with bars. No community showed a relatively stronger association with islands. Linear mixed models showed that the three geomorphic units significantly differed in mean elevation, fine sediment depth, and geomorphic persistence, but not all Tukey contrasts were significant, and absolute differences in mean elevation above talweg were quite small (<25 cm). Moreover, the three woody communities were not always related to corresponding geomorphological gradients, which reflected the river's complex history of channel adjustments. Most notably, mean grain size did not differ between either geomorphic or vegetation units. This study therefore indicates that riparian woody vegetation along altered gravel-bed rivers may differ substantially from those characterizing near-equilibrium river systems.

Keywords

Riparian vegetation, fluvial island, gravel-bed river, incised river, channel morphology, regulated river