INTRODUCTION

Channels and floodplains of mountain streams and rivers are highly dynamic ecosystems controlled by various hydrological and geomorphic processes (Tockner et al., 2010). Natural disturbance cycles and processes of sediment erosion, transport and deposition are major drivers of the high variability of channel morphology (Nilsson and Svedmark, 2002). Man attempts to control fluvial processes by narrowing and straightening the channels but such activities negatively impact the integrity and food webs of river ecosystems (Wyzga et al., 2013). Bed degradation, leading to rapid river incision, is one of the most severe consequences of channel regulation, especially in mountain areas (Bornette and Heiler, 1994; Wyszga, 2001, 2008). Rapid incision of many rivers has also been induced by gravel mining carried out in their channels in the 20th century (Rinaldi et al., 2005).

River incision is the process of channel bed erosion, often reaching bedrock, which leads to the loss of the channel ability to store alluvium (Bravard et al., 1997; Amoros and Bornette, 2002; Steiger and Gurnell, 2003). Over time, an incised river becomes a vertically closed system, permanently separated from the adjacent valley floor. With the lowering of river water level and the increase in steepness and height of channel banks, even relatively high flows are conveyed within the deeply incised channel, thus decreasing the duration and frequency of floodplain inundation (Wyzga, 2008; Wyzga et al., 2015). This particularly affects the potential for high diversity of riparian areas as the variability of bankfull flow and the associated natural flood cycles are the main controls on this dynamic ecosystem supporting a range of habitats attractive for plants and animals with special adaptations (Ward et al., 2002).

Changes in hydromorphological parameters caused by river incision and decreased sediment deposition within the active channel negatively affect not only the biota inhabiting the low-flow channels such as benthic invertebrates (Wyzga et al., 2012a, 2013) or fish (Payne and Lapointe, 1997; Shields et al., 1998; Jeffres et al., 2008; Wyzga et al., 2009), but also those living on exposed riverine sediments and within riparian zone (Engelhardt et al., 2012). Several