

Relationships between recent channel adjustments, present morphological state and river corridor vegetation in the Fortore River (southern Italy)

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The Fortore River, as many other rivers in Italy, has experienced huge channel adjustments during the last 60 years that were mainly caused by anthropic interventions, especially in-channel mining and the closure of the Occhito dam in 1966. Such changes deeply modified extension and morphological characteristics of the river corridor and, consequently, also its ecological features.

The present study aims to better understand the relationships between channel adjustments and river corridor vegetation changes and those between morphological features and environmental quality of the present-day river corridor.

The study has been carried out by means of a multi-temporal GIS analysis of topographic maps and aerial photographs integrated with topographic, geomorphological and ecological field surveys.

Results highlight that channel adjustments occurred through two distinct phases. Most of the channel changes occurred from the 1950s until the end of the 1990s (phase 1) and led to an overall channel narrowing (from 81 to 96%) and channel bed lowering (1-4 m). These changes were accompanied by pattern shifts from multithread to single-thread configurations. The reaches located downstream of the Occhito dam were affected by more intense modifications, especially channel narrowing, with respect to upstream reaches.

From 2000 to 2016 (phase 2), a trend inversion occurred. Downstream reaches remained essentially stable, while upstream reaches were affected even by some channel widening and bed aggradation and slight increase of the extension of floodplain areas giving more space to the potential development of the riparian vegetation.

The evolution and the present geomorphological conditions of the river corridor are also reflected by the state of the riparian vegetation. Upstream reaches are characterized by a higher richness in riparian vegetation types and vegetation cover with respect to downstream reaches. Best conditions occur especially in the upper Fortore valley. In the downstream reaches, riparian vegetation only consists of narrow bands of trees squeezed between the river channel and the cultivated areas. Consequently, the ecological functionality of the river corridor is highest in the upper valley and decreases gradually downstream. Anyway, along the Fortore River, several habitats and species of European interest (Habitats Directive 92/43/ECC) have been found, such as EC habitats 92A0, 3260, 3270, 3280 and the European otter. However, the conservation status of these habitats and species is critical particularly in the medium-lower valley where a buffer zone between the river channel and the cultivated land should be restored for enhancing the natural recovery of the channel system and allowing the local retreat of river banks during flood events.

On overall, the present-day geomorphic-ecological characteristics of the Fortore River corridor show that the reaches located in the medium-upper valley, upstream of the dam, present a good morphological quality, a high richness in vegetation and elevated recovery potentials. Instead, the reaches located in the lower valley, downstream of the dam, are characterized by overall bad morphological and ecological conditions and scarce to nil recovery potentials.