

Geomorphological and ecological effects of check dams in mountain torrents of Southern Italy

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It is known that installation of check dams noticeably influences torrent morphology and ecology. However, the effects of check dams on channel section and riparian vegetation of torrents are not yet completely understood.

This paper provides a further contribution to a better comprehension of the actions played by check dams on hydrological and geomorphological processes in headwaters and their effects on riparian ecosystem. Field surveys on channel morphology, bed material and riparian vegetation were carried out close to five check dams in each of four mountain reaches of Calabria (Southern Italy). For each check dam three transects (one upstream, one downstream and one far from the check dam, located in the undisturbed zone and adopted as control) were identified; at each transect, a set of geomorphological and ecological indicators were surveyed as follows. Channel section morphology was assessed by the width/depth ratio (w/d); the median particle size (D_{50}) and the finer sediment fraction ($\%fines$) were chosen to characterize channel bed material; the specific discharge (q , the discharge per channel unit width) was assumed as measure of the flow regime. Vegetation cover and structure were evaluated by Global Canopy Cover (GCC) and Weighted Canopy Height (WCH) respectively (Bombino et al., 2008); the index of alpha-diversity (H -alpha, Hill, 1973) and the ratio between the number of alien species and the number of native species (NSA/NSN) were chosen as indicators of species richness/abundance and degree of vegetation integrity, respectively.

Compared to the control transects, the values of w/d were higher upstream of check dams and lower downstream; conversely, q was lower upstream and higher in downstream sites. Upstream of the check dams D_{50} of bed material was lower and $\%fines$ was higher compared to the control transects; vice versa, the downstream transects showed higher D_{50} and lower $\%fines$.

The differences in the riparian vegetation among transects were found as the torrent ecological response to the strong contrasts surveyed in hydrological (q) and geomorphological (w/d , D_{50} and $\%fines$) characteristics. Compared to control transects, vegetation was more extensive (higher GCC) and developed (higher WCH) in the upstream zones; the reverse pattern was noticed in the downstream transects (lower GCC and WCH). The indexes H -alpha and NSA/NSN were higher upstream of check dams: the presence of the check dams induced higher species richness and evenness, with alien species prevailing over native ones in the sedimentation wedge. Conversely, downstream of check dams H -alpha and NSA/NSN were lower: here, riparian vegetation lost some herbaceous species and assumed a terrestrial character.

Overall, this study confirms on a quantitative approach that check dams have far reaching effects on geomorphology and ecology of mountain torrent channels; as a consequence, important and complex changes occur not only in the extent and development of riparian vegetation, but also in the species diversity and distribution.

REFERENCES

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