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The influence of channel geomorphology and vegetation cover on check dam conditions and effectiveness in a large river of México

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There is limited information describing the influence of site characteristics on post-construction conditions and effectiveness of check dams at the watershed scale. In particular, it is important to achieve a better understanding of some geomorphological and vegetation factors (such as check dam geometry, channel morphology and vegetation cover) on sediment retention capacity and structure functioning. To address these issues, a combination of multivariate statistical techniques were applied to the most important characteristics of 273 check dams installed 3-5 years ago in a Mexican large watershed.
This quantitative analysis showed that the failure of check dams was associated with low vegetation cover of the drained sub-watersheds; conversely, with a well developed vegetation cover the majority of check dams were functional or filled, in both cases not broken. Taller structures were most likely to be exposed to failure risk, while check dams with lower height, but with well-developed sediment wedges and large vegetation cover, were more stable. Finally, upstream height of check dams and vegetation cover of the drained sub-watersheds were factors with a considerable influence on sediment retention processes acting behind the stone structures.
Overall, this study has provided a quantitative evaluation of the dominant factors influencing the post-construction conditions of check dams and their ability to store sediment, and thus provides land managers insights into the best strategies for soil conservation at the watershed scale using check dams. These findings suggest that managers: (i) consider with caution the installation of control works (such as stone or rock check dams) in sub-watershed with low vegetation cover and highly erodible soils, since here the high sediment transfer rates may increase the structure failure likelihood; (ii) adopt a larger number of small structures rather than controlling the evolution of the channel longitudinal profile by large-sized check dams, since taller structures are most likely to be exposed to failure risk, thus loosing much of their functioning.