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Soil erosion of sediment sources and their impact factors in a check dam control watershed on the Loess Plateau of China

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Quantitative analysis of sediment sources is crucial for soil and water conservation. For instance, composite fingerprint identification technology is widely used to study sediment sources in small dam-controlled watersheds, but its use in historical reconstructions of soil erosion in sediment source areas is uncommon. As soil erosion is a major issue in some areas of China, we propose the combination of flood couplet construction with the fingerprint method to estimate soil erosion in sediment source areas of a typical check dam on the Loess Plateau, which is known for its severe soil erosion. A flood couplet, based on the activity of ^{137}Cs in the sediment, was constructed, and the historic soil erosion was calculated using soil bulk density and storage capacity curves. The contribution rate of the sediment sources was calculated by using the fingerprint method, and the amount of erosion in the sediment source areas was estimated. We found 29 flood events (1956–1990); the total sediment volume was approximately 56121 m^3 , and the sediment yield was approximately 77430 t. The best fingerprint combination (Cr, Ni, V, and TOC) allowed to a 97.2% the recognition of the sediment sources. The contribution rates of ditches, cultivated land, grassland, and shrub land were 44.89%, 26.38%, 10.49%, and 18.24%, respectively. Meanwhile, the average sediment yield of ditches, farmland, grassland, and shrub land were 1227, 751, 512, and 279 t, respectively. These results provide an effective scientific basis for the rational allocation of soil and water conservation measures in small watersheds.