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Landscape analysis of runoff and sedimentation based on land use/cover change in two typical watersheds on the Loess Plateau

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Land use change is a major influencing factor in ecological and environmental issues, and sedimentation and runoff variations caused by land use change have emerged as important research areas. The aims of this study were to determine changes in landscape patterns, and runoff and sedimentation characteristics, and to investigate the relationship between landscape metrics (LMs), runoff, and sedimentation in two watersheds. Four key results were obtained. (1) Grassland (GRA) was the dominant landscape in the two watersheds. Unused land (UNL) in the Tuweihe watershed and farmland (FAR) in the Gushanchuan watershed experienced the greatest transformations, with changes in area of 453.94 and 52.85 km², respectively, between 1985 and 2010. (2) The landscape in the watersheds tended to become regular, connected, and aggregated. The landscape stability of the Tuweihe watershed was higher than that of the Gushanchuan watershed. (3) Annual runoff and sediment levels gradually decreased. The runoff in the Tuweihe watershed was greater than in the Gushanchuan watershed, but the sediment yields of the two watersheds were similar. There was a significant relationship between annual runoff and sedimentation ($P < 0.01$). (4) The LMs had a significant linear relationship with runoff and sedimentation ($P < 0.01$). The correlation coefficients for LMs and runoff were higher than those for LMs and annual sedimentation yield. Shannon's evenness index (SHEI) and the patch cohesion index (COHESION) had the greatest effects on runoff and sedimentation. Our results suggested that the relationship between the LMs, and runoff and sedimentation could provide a scientific basis for the prevention and treatment of water loss and soil erosion.

Keywords □ land use/cover change; landscape; runoff; sedimentation; Yellow River