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Spatial Distribution and Key Prevention Areas of Ephemeral Gully under the 'Grain for Green Project' in Loess Plateau, China

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Soil erosion is an important threat in the high-quality development of the Loess Plateau of China, and Ephemeral Gully (EG) erosion is an important erosion type. Answering the distribution characteristics of EG at the regional scale is an important basis for EG control. The regional distribution of EG and the areas that still at high risk of EG development after the 'Grain for Green Project' since more than 20 years ago remain poorly understood. This study aimed to solve the above problems by using visual interpretation based on sub-meter Google Earth images in 137 systematically selected small watersheds in the Loess Plateau. The EG density, length, land use of the hillslope where each EG existed, and other parameters were obtained and analyzed using the GIS method. The spatial distribution of EG density, average length, and spatial correlation in the Loess Plateau was explored. The current EG distribution and key prevention areas in the Loess Plateau were identified. The results showed that: (1) EGs were found in 46 surveyed watersheds accounting for 33.6% of the total watershed number, with an EG density average value of 3.41 km/km² and maximum value of 21.92 km/km². The average number of EG was 60.32/km². EG length was mainly distributed in 20 ~ 60 m, with an average length of 63.31 m; The critical slope length of EGs was mainly 40 ~ 60 m, with an average 56.20 m. (2) The watersheds with EGs were mainly located in the north-central, the west, and northwest of the Loess Plateau. EG erosion is extremely strong in loess hilly and gully region, and moderate in loess plateau gully region. (3) 38.3% of EG was distributed in cropland; 35.3% distributed in grassland; 22.8% distributed in forest land. After the 'Grain for Green Project', the EGs that were still distributed on cropland were a more important threat to soil erosion and need better prevention efforts. EGs located on cropland were still widely distributed in many areas of Loess Plateau, such as the northwest of Yan'an City in the middle and upper reaches of Beiluo River, Suide and Luliang in the lower reaches of Wuding River, at the junction of Dingxi and Huining and in Qingyang area. This research would help in a more reasonable distribution of erosion control practices in the Loess Plateau.