

Forest land disturbance and geomorphological effects in Korea

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This study explores the effects of historical deforestation in the Korean Peninsula. Deforestation probably occurred mainly in the seventeenth and eighteenth centuries and resulted in serious land degradation by hillslope erosion. The spatial pattern of forest land degradation was mapped from statistical records and documents prepared for erosion control projects from 1907 to 1937. The greatest intensity of degradation was found in the middle part of Korea around Seoul.

A substantial degree of relationship exists between the population concentration and the degree of land degradation. It was found that areas adjacent to or easily accessible river routes were heavily degraded despite low population density but with river route access. The area around the capital (Hansung or Seoul) became the most degraded zone in the country because of the forbidden mountain policy which prohibited the entry into mountains in the vicinity of the capital.

Deforestation can modify the channel morphology and drainage network. Erosion typically results in an increase of channels and a denser drainage network. Two contrasting areas were analyzed to determine whether deforestation contributed to a denser drainage network. Koyang basin (deforested) showed higher drainage density and longer first and second order streams compared with Kwangneung basin (not deforested). The result implies that forest disturbance helped to develop more first order streams.

Aerial photos from 1950-1953 were analyzed to identify erosional processes. The dominant process is gullying by water erosion. To determine what geomorphic variables control gully development, a regression analysis with gully density as the response variable was done. This analysis showed that gully density varies as a function of slope facet area, slope facet length, slope facet width, and slope facet evaluation difference. Gully development led to denser drainage network in deforested basins.

This study contributed to recognizing the effects of disturbances. Findings of this study can be used as the initial understanding toward better management of human-disturbed landforms and a guide for future environmental management in the forest lands of Korea.