

黃土高原森林植被對土壤水分循環過程的影響

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摘 要 黃土高原地區森林植被影響土壤退化的主要表現形式是土壤乾燥化，其顯著特徵是因植物蒸散過量耗水會成的植物根系作用範圍內土壤水分長時間持續地嚴重虧缺，天然降水已不能有效予以補償，局部微氣候環境趨乾旱化、土壤表層結殼，土壤硬度增大、植被生長衰退、天然下種更新不良及加大造林難度，從而導致植物生長明顯衰退以至大面積乾枯死亡。土壤乾層的形成是乾擾和破壞植物演替序列及其土壤水分生態基礎造成的後果，從而引起土壤乾燥化的加重。在詳細分析土壤乾層現象和類型的基礎上，分析了土壤乾層的成因，即低降水高蒸發、水土流失、植被類型選擇失當、群落生產力過高和群落密度過大等。從生態水文角度分析了土壤乾層因其水分虧缺阻隔重力水下滲，減弱了降水垂直入滲補給地下水的的作用，指出黃土高原地區森林因其顯著攔蓄逕流作用，蓄積水分又難以轉化為地下水，因而具有降低林地出境總逕流量的作用。

關鍵詞：森林植被，水分循環，土壤乾燥化，黃土高原。

Impacts of Forest Vegetation on the Soil Water Cycle in Loess Plateau

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ABSTRACT Soil desiccation is the most serious problem in the forest vegetation in China's Loess Plateau. It shows long term and severe shortage of soil water in the rhizosphere due to high water consumption by plant transpiration, insufficient compensation by precipitation and the dry local microclimate. It leads to soil surface crusting, increase of soil bulk density and scarce plant vegetation cover. Afforestation is getting more difficult and forest deterioration occurs in large areas. Based on the detailed observation in the dry soil stratum, this paper presents the reasons for such problems. Arid soil-layer is the ecological aftermath of strengthened soil desiccation resulted from the disturbing and breaking alignment of plant succession and ecological foundation of soil water. Our results show that high evaporation demand, water and soil loss, unsuitable selections of vegetation types, and large population density are probably the major reasons. Some recommendations are also presented in this paper. These include proper selection of vegetation types, reducing population density and adjusting population productivity reasonably according to local precipitation so as to keep the balance between transpiration

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and soil water storage. Following these recommendations, a sustainable population and production can be maintained. The negative effects of the dry stratum on the surface water infiltration for recharging underground water were discussed in terms of ecological hydrology. The dry soil profile discontinues the link between surface water and underground water and forests reduces the total amount of runoff going out of forest areas. This leads to small surface and ground runoffs that affect water cycling in a watershed scale.

Key Words: forest vegetation, water cycle, soil desiccation, Loess Plateau.