Ecological Effectiveness of Large-Scale ecological restoration projects across the Qinghai-Tibetan Plateau over the past three decades

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Abstract

Abstract Qinghai-Tibetan Plateau is an important ecological security barrier in China, and alpine ecosystem presents a trend of overall improvement under the influence of climate change and human activities, yet there are localized deteriorations. In order to improve the ecological function of the Tibetan Plateau, large-scale ecological restoration projects (ERPs) have been carried out in Tibetan Plateau over the past 30 years. From following the footstep of national ecological constructions to the implementation of projects specific to the plateau characteristics, the ERP of the plateau can be divided into three stages. Major ERPs focusing on four types of projects, i.e. forest protection and construction, grassland protection and construction, water and soil erosion control and desertification land management, with a total area of 850,000km ^{2} across the Qinghai-Tibetan Plateau. The positive effect at sampling quadrat scale has been widely verified, and the responses of productivity and species diversity were inconsistent. The positive effect at the regional scale gradually emerges, yet the spatial difference is significant, and the quantification of driving forces is an important prerequisite. The positive and negative effects of existing ERP on biodiversity conservation are revealed, for instance, there is a significant increase of rare wild animals in natural reserves and in artificially planted areas it failed to effectively curb the loss of animal and plant diversity. The long-term effects of various ERPs on the biodiversity should be taken into account so as to optimize the ecological measures and build a sustainable management model after project restoration. By summarizing the achievements and problems of ERP across the Qinghai-Tibetan Plateau in the past 30 years, we proposed to set stepwise ecological restoration and management scheme by different restoration goals and reference modes in three stages, i.e. "Environmental treatment—Ecological restoration projects—Adaptive management".

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