

>> SYNTHESIZE MOUNTAINS OF KNOWLEDGE <<

Submitted Abstract

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Abstract

The United Nations General Assembly declared 2022 as the International Year of Sustainable Mountain Development based on the proposal of the Kyrgyz Republic. Few studies investigate vegetation changes in montane pastures arising from long-term grazing and environmental changes. Using resurveys and image analysis, we explored the responses of mountain vegetation to management and environmental changes in the Western and Central Tien-Shan to investigate (1) whether the plant communities in six vegetation types (ecozones) had changed over 44 years, (2) whether changes were related to management or ecological causes, and (3) whether used analysis methods enable to acquire environmental changes impacts. Ecological indicator values (EIVs) offer integrated signals of species-environmental relationships at the level of communities and vital information about long-term changes in environmental conditions at the site. As a complementary method in 2021, we took 102 near-nadir digital photographs at 47 sites along with a pair of 100 m orthogonal transects. Based on historic vegetation data (1973-1987), six ecozones were resurveyed annually from 2008 to 2021 and connected with species' management-related traits and EIVs. Overall, homogenization of vegetation within and among ecozones was observed. Mountain steppe, meadow-steppe, and subalpine meadows showed the strongest convergence towards dominance of mesic shrubs, related to increasing precipitation changing soil moisture, and soil-salt regimes. In high mountain steppe and alpine ecozones, cushion dwarf shrubs increased, driven by increased soil moisture following faster snowmelt. Changes in the semidesert were related to highly variable spring soil moisture. Compositional changes accelerated over time. We identified six types of pasture degradation and their inter-linkages to illustrate how semiarid landscapes undergoing vegetation transitions may function in future climatic conditions under unchanged grazing practices. Analysis of digital photos enables us to glimpse hidden stages of vegetation change. Image-based data collection and analysis is less biased, making permanent resource records available for reanalysis when data are questioned or when management objectives change.