

GC31B-0471 Quantifying landscape resilience using vegetation indices

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Landscape resilience refers to the ability of systems to adapt to and recover from disturbance. In pastoral landscapes, degradation can be measured in terms of increased desertification and/or shrub encroachment. In many countries across Central Asia, the use and resilience of pastoral systems has changed markedly over the past 25 years, influenced by centralized Soviet governance, private property rights and recently, communal resource governance. In Kyrgyzstan, recent governance reforms were in response to the increasing degradation of pastures attributed to livestock overgrazing. Our goal is to examine and map the landscape-level factors that influence overgrazing throughout successive governance periods.

Here, we map and examine some of the spatial factors influencing landscape resilience in agro-pastoral systems in the Kyrgyzstan Republic where pastures occupy >50% of the country's area. We ask three questions: 1) which mechanisms of pasture degradation (desertification vs. shrub encroachment), are detectable using remote sensing vegetation indices?; 2) Are these degraded pastures associated with landscape features that influence herder mobility and accessibility (e.g., terrain, distance to other pastures)?; and 3) Have these patterns changed through successive governance periods? Using a chronosequence of Landsat imagery (1999-2014), NDVI and other VIs were used to identify trends in pasture condition during the growing season. Least-cost path distances as well as graph theoretic indices were derived from topographic factors to assess landscape connectivity (from villages to pastures and among pastures). Fieldwork was used to assess the feasibility and accuracy of this approach using the most recent imagery. Previous research concluded that low herder mobility hindered pasture use, thus we expect the distance from pasture to village to be an important predictor of pasture condition. This research will quantify the magnitude of pastoral degradation and test assumptions regarding sustainable pastoral management. As grazing is the most extensive land use on Earth, understanding the broad-scale factors that influence the resilience of pastoral systems is an important issue globally.

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