Effect of Anthropogenic Disturbances on Plant Functional Groups Diversity, Composition and Ecosystem Stability of Meadow in Kanasi Reserve

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Introduction Human-driven grassland ecosystem degradation has highlight questions about how the number and composition of plant functional groups in a grassland ecosystem influence its functioning (Tilman D. et al., 2006). Although biodiversity and composition are now known to affect grassland ecosystem productivity (Tilman D. et al., 1997), their effects on stability are debated.

Methods Here we present the dependence of the temporal stability of ecosystem and functional groups (shrubs and half shrub, perennial bunch grasses, perennial rhizome grasses, sedges, forbs, legumes, annuals and biennials) on plant diversity in a short-term meadow experiment that divided into four disturbance intensities (light, moderate, heavy and over) and established 100 plots. Ecosystem stability is defined as S= standard deviation of aboveground biomass within each plot/mean aboveground biomass. Functional groups dominance is defined as D=(relative height+relative density+relative coverage+relative biomass)/4. We determined functional groups diversity and ecosystem stability with the use of 2 years (2006-2007) of data collected annually on plant species, individual height, density, coverage and aboveground biomass within each plot(0.5m×0.5m). The regression of aboveground biomass on functional groups diversity was analyzed with the use of *repeated measures MANOVA*.

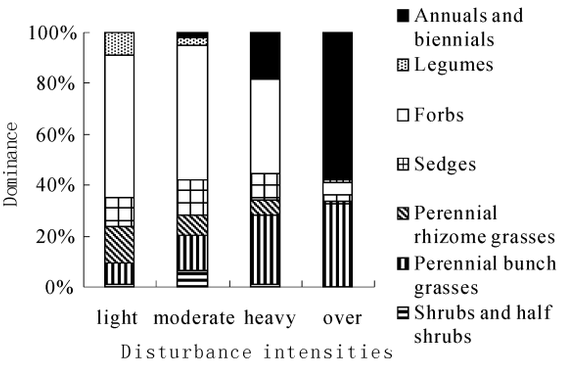

Figure 1 *Changes of functional groups dominance under four disturbance intensities.*

Results and discussions The dominance of perennial bunch grasses, annuals and biennials increased with increasing disturbance intensities, on the contrary, perennial rhizome grasses, forbs and legumes decreased (Figure 1). The results showed that perennial bunch grasses, annuals and biennials have greater endurance and resilience to disturbance, whereas perennial rhizome grasses and legumes have more sensitivity. The treatments of light and moderate disturbance intensities had lower standard deviation (lower risks) for a given mean biomass (return) (Figure 2). The results showed that lower disturbance intensity leads to less ecosystem productivity fluctuation and greater ecosystem stability.

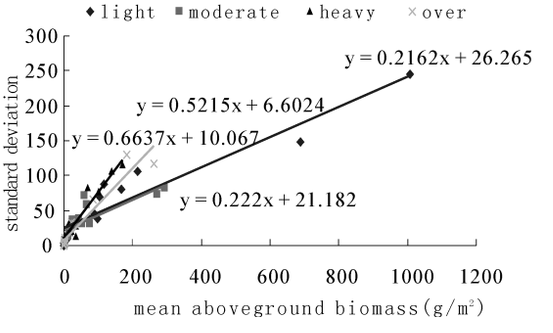

Figure 2 *Effects of disturbance intensities on ecosystem stability.*

Conclusions Perennial bunch grasses, annuals and biennials have greater endurance and resilience to disturbance and they can adapt to more intense disturbed habitat. Whereas perennial rhizome grasses and legumes have more sensitivity to disturbance and they can adapt well to equable" habitat. The greater ecosystem stability of lower disturbance intensity plots resulted from their having lower standard deviation. In total, on average across the two years of measurement, ecosystem stability was significantly dependent on the changes of functional groups composition and diversity under different disturbance intensities.

References

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