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What caused the degradation in 20 years of elm (*Ulmus Pumila L.*) woodland in China

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Introduction As a special rangeland, elm (*Ulmus Pumila L.*) woodland, fixing sand and supplying forage to herbivores, is a woody plant community distributed on sand dunes in meadow steppe regions under semi-hydrophilous or semi-arid climate (Zhu, 1992). Since 1980s, its distribution region has been shrinking severely in China. So we aim to anchor the degraded reasons through comparing elm woodland species changes under different disturbances between 20 years.

Materials and methods In Songnen grassland of China, we sampled undisturbed elm woodland in 1983 (No. 1), and in 2004, we sampled another five sites, i.e. the undisturbed site (No. 2), 40% and 90% farming sites (according to crop coverage) (No. 3 and 4), light and heavy grazing sites (determined by distance 600 and 200m to the nearest village) (No. 5 and 6). In each site, we sampled 10 4m² plots, and species names, number and aboveground biomass were measured. Species diversity was calculated by Shannon-Weaver index and ANOVA test was carried out through SPSS 13.0.

Results Comparing with 1983, species diversity and aboveground biomass of undisturbed elm woodland in 2004 were decreased, but not significantly ($P > 0.05$), and 8 forbs disappeared. Both farming and grazing decreased species diversity, but only significant in 90% farming and heavy grazing sites ($P < 0.01$) (Figure 1-A), furthermore those two sites were dominated by annual grasses and lost more than 15 species comparing with the undisturbed sites. 90% farming site had the highest aboveground biomass, and the two grazing sites were the lowest of all ($P < 0.01$) (Figure 1-B).

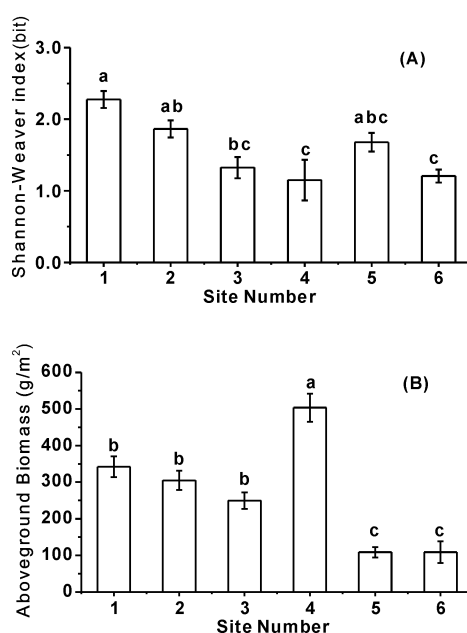


Figure 1 Shannon-Weaver indexes and Aboveground Biomass of sites. The site number 1 to 6 represents undisturbed elm woodland sites in 1983 and 2004, 40% and 90% farming sites, light and heavy grazing sites, respectively. Means with different letters are significantly different at $P < 0.01$ level among sites. Error bars show Mean \pm 1 SE.

Conclusions Farming and grazing decreased species diversity and biomass of elm woodland. 90% farming site had the lowest diversity, but the highest aboveground biomass in contrast, which caused by high evenness and productivity of crops. Gazing was the direct factor resulting in aboveground biomass reduction, even if light grazing had relatively high species diversity, but the loss of 12 species and plant production is inevitable. Therefore, farming and grazing are main factors caused elm woodland degradation in China, but not the direct effect of global climate changes, to our study.

Reference

Zhu, T. C., 1992. Grassland of China. In: Coupland R. T. Natural grassland—Eastern hemisphere, Ecosystems of the world. Amsterdam: Elsevier Science Press. 8B, 61-82.