



Feedbacks between aeolian processes and ecosystem change in a degraded desert grassland in the southwestern US

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The desert grassland in the southwestern US has undergone dramatic vegetation changes with many areas of grassland becoming shrublands in the last 150 years. A principle manifestation of such a land degradation is the wide distribution of fertile islands in once-homogenous landscapes, which changed soil resource redistributions through the movement of resources from plant interspaces to the area beneath plant canopies. A great deal of work has examined the role of water in nutrient reduction and enforcement of islands of fertility in the semiarid landscapes. However, little is known on the role of wind in the removal or redistribution of soil resources, and further the feedbacks between wind and ecosystem change in this area. In spring 2004, a vegetation removal experiment was established in the northern Chihuahuan Desert, southern New Mexico, where vegetation cover on the experimental plots were manually reduced to various levels to study the entire suite of aeolian processes, including erosion, transport, and deposition in creating and enforcing patchy distribution of vegetation. This experiment has been continually maintained for more than ten years, with the sampling and observation of vegetation cover, soil nutrients, sediment flux, topography, and plant physiology. The experimental results highlighted that the aeolian processes in the Chihuahuan Desert are able to change soil properties and community composition in as short as 3 three years. Further, the removal of grasses by 75% may trigger a very substantial increase of wind erosion and the removal of grass by 50% could cause significant amount of C and N loss due to wind erosion. Last but not least, the change of the spatial distribution of soil C and the micro-topography both point to the fact that aeolian processes contribute substantially to the dynamics of fertile islands in this desert grassland.