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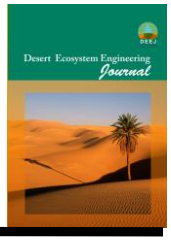

Evaluating the Success of Fine Dust Hotspots Control Projects Using Structural and Functional Characteristics of the Habitat in the West Shore of Urmia Lake

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Expanded abstract

Introduction: As one of the most serious environmental challenges of Iran during the recent decade, the phenomenon of fine dust has occurred due to improper and excessive ecologic use of rangeland ecosystems, drought, and mismanagement of water resources. Knowing this phenomenon and being aware of the required strategies to fight against it play an essential role in reducing the number of dust storms and the way fine dust's hotspots are established. On the other hand, the hotspots of fine dust have been created in large areas of Urmia Lake's saline lands due to the regression of the lake made by a decline in groundwater levels and reduced inflow of water into the lake exposing Western and Eastern Azerbaijan provinces to dust storms. Accordingly, some restoration projects (rangeland seeding) were carried out in 2014 in large areas of the lake to stabilize the soil of the hotspots' beds. Now, five years after the implementation of rangeland seeding projects, the question is whether or not the projects have exerted any positive effect on the structural and functional characteristics of the target habitats? In other words, how have the structural and functional characteristics of the habitats changed as a result of rangeland seeding operations? Have these changes had positive or negative effects on the ecosystem? Therefore, to answer these questions, this study was conducted in the Separghan region in Urmia as a pilot study area and a representative of saline habitats of the western shore of Urmia Lake. Located at 37° 45' 14"N and 45°14'19", the region was identified as one of the fine dust hotspots in 2014 and designated as a priority in terms of protective and conservation operations by competent authorities. It was also introduced as a reference and pilot study area so that the results of the study could be generalized to similar habitats. Therefore, rangeland seeding operations were carried out in the region at a large scale where livestock grazing was prohibited.

Material and Methods: 24 transects were established in three ecological areas to measure the structural and functional characteristics of the habitats. Moreover, the number, length, and width of ecological patches, the

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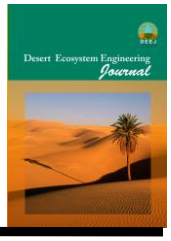

percentage of patches' lengths, and the landscape organization index were calculated for each area by establishing linear transects in each ecological unit. Finally, eleven indices regarding the soil's surface that are clearly associated with the soil's level of stability, permeability, and nutrient cycle were valued and categorized for each patch and inter-patch space within the five measured areas using the LFA guidelines.

Results: the study's results indicated that the indices' mean varied along the salinity gradient, being significantly different in various ecological areas. The highest value of the landscape organization index (0.32) belonged to the first area (further away from the salinity hotspot), and the lowest values of the index (0.10 and 0.06) belonged to the second and third areas (closer to the salinity hotspot), respectively. The average values of the stability index were 44.40, 37.01, and 20.70 in different ecological zones, respectively. Furthermore, the highest values for permeability were found in the first and second zones as 21.50 and 24.90, respectively, and the lowest index's value (13.20) belonged to the third zone. Finally, the values of the nutrient cycle were 11.19, 11.80, and 7.90 in the first, second, and third ecological zones, respectively.

Discussions and Conclusion: it could generally be argued that the values of structural and functional indices decrease along the salinity gradient. Therefore, the success of rangeland seeding operations would decrease as we get closer to the salinity hotspot. In other words, rangeland seeding operations have failed to realize the goals set for the first step of its executive operation to increase vegetation and reduce inter-patch spaces in areas close to the lake. Viewed from another perspective, it can be concluded that seeding the rangeland with *Nitraria schoberi* species was hardly successful and failed to achieve its expected results in terms of controlling the fine dust several years after the implementation of the project. Therefore, preserving the area and less manipulating the soil's surface is recommended when rangeland seeding is conducted in such habitats. If prevented from being grazed, indigenous vegetation could be regenerated through the seed bank and thus help prevent soil surface from wind erosion. The results of this study can help seed the rangelands prioritized for being protected against the advancement of saline dust hotspots. The areas prioritized in terms of protection and maintenance of their current situation are those with high structural and functional indices values. Areas where the inter-patch space is large and the landscape organization index is very low compared to other places can also be prioritized for restoring projects.

Keywords: Saline Lands, Rangeland Seeding, Dust, Habitat Characteristics.