Mapping Spatial Prediction of Plant Species Using Logistic Regression
(Case Study: in Rineh Rangeland; Damavand Mountain)

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Extended Abstract

Introduction
Vegetation and environmental factors have close relationships; also they affect each other in the rangeland ecosystems. This study was carried out to investigate creation of plant species spatial prediction map based on environmental factors that affect plant species. Prediction of vegetation spatial distribution across the landscape based on spatial distributions of environmental variables affecting vegetation is defined as modeling of vegetation prediction. Environmental variables maps should be available or create vegetation map to be practical and useful mapping prediction of vegetation. These prediction maps are used for biodiversity conservation, ecological restoration and assessment of impacts of environmental changes on the distribution of vegetation. To increase the accuracy of analysis, researchers have to limit the number of variables in study relationships between the environmental variables and plant species. Relationship between plant species and soil characteristics, climate and topographical factors and their effects on the distribution of plant species using logistic regression were discussed in the study area.

Methodology
This study was carried out in Reineh rangelands on the southern slope of Damavand Mountain. Sampling method was equally randomized classification. 37 study homogenous units were created with the classification of study area based on slope, aspect and elevation. 10 plots were...
located randomly in each homogenous unit and also 2 soil samples were taken from 0-30 cm depth. Presence or absences of dominant species were noted in each plot. Some of environmental factors including 16 soil characteristics, 3 topographic and 16 climatic factors were selected. IRS satellite imagery were used as auxiliary data.

Logistic regression method was used to determine the effective environmental factors on species and model dominant species. Environmental factors maps of affecting plant species were prepared in GIS environment. Logistic regression model of dominant species was applied on the maps of affecting factors on species in GIS environment and prediction map of the presence and absence of species was created.

Optimum thresholds for classification of presence and absence of species were determined from sensitivity, specificity and overall accuracy graph. Accuracy of created maps was assessed with calculation of the error matrix for sample points map as ground truth map and created map using logistic regression model.

**Results and Discussion**

Eight species of 107 species and perennial grasses were identified as the dominant species in the study area and prediction map using logistic regression model were created for them. Results indicated that the produced models had high accuracy except model of *Astragalus ochrodeucus* (with accuracy 80 percent).

Only near-infrared band was entered to logistic model of this species. All of the entered variables into logistic models were from all of soil, climate, topography factors and satellite imagery. Soil properties including pH, percent of clay, silt and sand, nitrogen, wilting point, bulk density, true density, phosphorus and soil water storage capability (10 from 16 studied soil properties) were effective on the distribution of species. Slope and climate factors including the number of frost days during the year, the average minimum temperatures in spring, the average rainfall in spring and mean daily temperature in summer season were identified as factors affecting distribution plant species. Since the maps of climate factors were created by interpolation than elevations, then influence of these factors on distribution of species show influence of the height indirectly

**Conclusion**

The relationships among vegetation and some of environmental factors including soil texture and structure, soil fertility, soil moisture, climatic and topographic factors were confirmed in the study area. A hypothesis of this research on determination of spatial pattern of plant species distribution based on environmental variables has been proved. Results of this study may be used for management purposes in rangeland ecosystems, sustainable development, conservation, restoration, monitoring and evaluation in the study area and similar regions.

**Keywords:** Prediction Map, Logistic Regression, Soil Characteristics, Climatic Factors, Topography.