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Investigation of Land Use Changes in Zarrineh Rud Catchment and Its Effect on soil Erosion Using WLC Model

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1-Introduction

Vegetation percentage is one of the most important and undeniable factors in the quantitative study and analysis of terrestrial plants (Zhang et al., 2003).As the amount of vegetation increases, the rate of soil erosion decreases (Alol et al., 1976).Vegetation parameter reduces soil erosion by protecting the soil against impact and rainfall, increasing the permeability of water to the soil, reducing the flow rate of surface runoff and improving the physical, biological, chemical and biological properties of the soil (believe , 1956).In addition, it can be said that the genus and type of plant during the winter, especially in agricultural lands, strongly affects the amount of soil erosion and water quality (Dabni et al., 2001).The phenomenon of soil erosion limits the structure and dispersion of land use changes (Lee, 2011). This activity will lead to challenges and tensions between humans and the earth's resources. Soil erosion is post-feed that depends on factors such as land use, vegetation, climate, topography and chemical, and physical properties of the soil (Zhao et al., 2017).

Purpose and method: The purpose of this study is to investigate land use changes in Zarrineh Rud catchment located in Shahin Dej city using object-oriented classification process for 2000 and 2018 and also to produce soil erosion map for these two years using WLC method. First, the images used by the US Geological Survey (USGS) were prepared after the images of radiometric and atmospheric corrections in ENVI software were applied to the images, then to extract the land use map of the study area by object-oriented method using the nearest algorithm. Neighbor was used in Ecognition developer software environment.

Finally, two indicators of kappa coefficient and overall accuracy were used to evaluate the produced maps. But to prepare the soil map, EDRISI SELVA software was used and with the help of WLC algorithm, which is one of the multi-criteria decision making methods. First, we prepare the desired layers including distance from communication

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roads, land use, geology, slope, distance from waterway and rainfall, then we standardize these layers and weigh each layer based on the situation of the region. Finally, Arc Gis 10.6 software was used to calculate the area and obtain the output of the maps.

2-Methodology

First, we standardize each of the layers in question. In the present study, the fuzzy logic method of standardization of maps was used.

In the fuzzy model, the maximum value of 1 is assigned to the highest membership and the minimum value of 0 is assigned to the lowest member in the set (Sui, 1999).After standardization, the standard weight maps of each factor were determined. Thus, directly, the weight is relative Awarded to each of the benchmark maps. Critical weighting method was used. In this technique, information is examined and analyzed based on the values of interference and contradiction between all criteria. Which is expressed in the context of a membership function. Each of the vectors formed for the factors that can be used have statistical parameters such as standard deviation. After estimating and calculating the standard deviation of the factors and factors in question, it is created in the form of different matrices in the form of M*M. Which includes the correlation coefficient between the formed vectors by specifying the specified factors,).By determining the above parameters, the contrast between criterion j and other criteria was calculated from Equation 4.

Relationship (4) $cj=8j\sum_{k-1}^{m}(1-rjk)$

3-Results and Discussion

The results of the classification showed that during the 18 years of land use, the average rangeland land use has decreased the most. This area reduction is equal to 30.93%. But the user who has had the most increase among all users in the interval of 18 years It is used for rainfed and irrigated cultivation because it leads to the destruction of pasture and barren lands by increasing the population. According to the results obtained from soil erosion zoning maps using WLC algorithm for 2000 and 2019, the study area can be expressed. High-risk and high-risk areas are in dryland, irrigated medium rangeland and residential areas. One of the most important factors of soil erosion in Zarrineh river basin can be the reduction of rangelands (rich, medium and low density)Because with the loss of natural vegetation will lead to a decrease in soil resistance on the one hand and on the other hand will increase the rate of soil erosion and consequently sedimentation 4-Conclusions

With the loss of vegetation in the Zarrineh River Basin, it has led to an increase in soil

erosion in 2018 compared to 2000.In addition, this type of land use change in the region and the conversion of pastures into rainfed and irrigated lands leads to an insignificant reduction in the amount of groundwater aquifers. This type of events in the future will cause harmful and destructive effects on the ecosystem of the study area. Therefore, as the results of this study and the research of other researchers show in addition to reducing the region's vulnerability to natural disasters and hazards, land use optimization leads to an increase in environmental sustainability. In this regard, the study of land use changes will be one of the first studies to study the stability of the regions.

Keywords: WLC method, Object-oriented classification, Landsat, land use, Zarrineh river catchment.

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