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Land Cover Management of Forest stands using the ETM+

***Behrouz Kord*[*] *and Seyed Armin Hashemi*[**]**
[*]*Department of Green Space Engineering, Malayer Branch,*
Islamic Azad University, Malayer, Iran
[**]*Department of Forestry, Collage of Natural Resources, Lahijan Branch,*
Islamic Azad University, Lahijan, Iran

(Corresponding author: Behrouz Kord)
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ABSTRACT: Optimum management of natural resources and forest parks requires in time, correct information. Drawing the map of land cover and more and more precise determination of this tool as a management parameter can assist the planners of various administrative sectors in management. Present study was performed to define the change in the land use level in the forest park and to define the factors influencing on these changes using remote sensing and GIS. Present study tries to define forest cover changes and to map the forest cover using remote sensing techniques and the image of ETM+ sensor in 1989.Vegetation as a dynamic phenomenon is always changing and transforming. Total accuracy of classification of the images related to 1989 is 0.7312 and kappa coefficient is 0.7247.

Key words: forest cover, Gisoom forest park, supervised classification, ETM+.

INTRODUCTION

The major method to analyze the information of an area is drawing the obtained information as a map is utilizing the satellite images, which have been provided for human since not so much years ago and nowadays by wonderful development of sciences it is utilized widely. In this regard, Aminy (2000) performed a case study in the "Armard" forest of baneh city with 19964h1 area to study the wide spread changes of forest and to map the forest level changes during 1960 to 2000. He has used the satellite images of EMT+ and IRSP6 sensors, and studied the relationship of 5 factors including slope, direction, altitude from sea level, distance from rural centers and rivers with wide spread changes of the forest. A result of this study indicates that in this case study, 4853h1 of forest level has decreased. Meanwhile, the relationship of physiographic and anthropological factors with these changes was studied using spearman correlation techniques and logistic regression model. Results of this study indicated that the distance from river has a reverse relation to the destruction event and eastern and northern direction have maximum and minimum destruction rate, respectively. Examination using logistic regression model also indicates the effectiveness of the factor of distance from road on the forest destruction.

MATERIALS AND METHODS

Study area: This is located as a forest strip remained from Talesh forest area in the North western Guilan provine 42 Km^2 far from major road of Anzaly port to Astara. Eastern part with about 887 h areas is assigned to the forest park (Fig.1). These calculations are including the mean, standard deviation, correlation matrix, and variance – covariance matrix in each band. For optimums use of multi spectral data, it is required to identify the best band composition for present study, using I1wis software, the best band composition of bands 3, 4, 5 was selected. Since it revealed the changes better than other compositions, and had the highest OIF value. Combination of bands 3, 4 and 5 of this sensor is a common combination to examine the various land covers and their uses which is called as pseudo Natural color due to display the vegetation in green color.

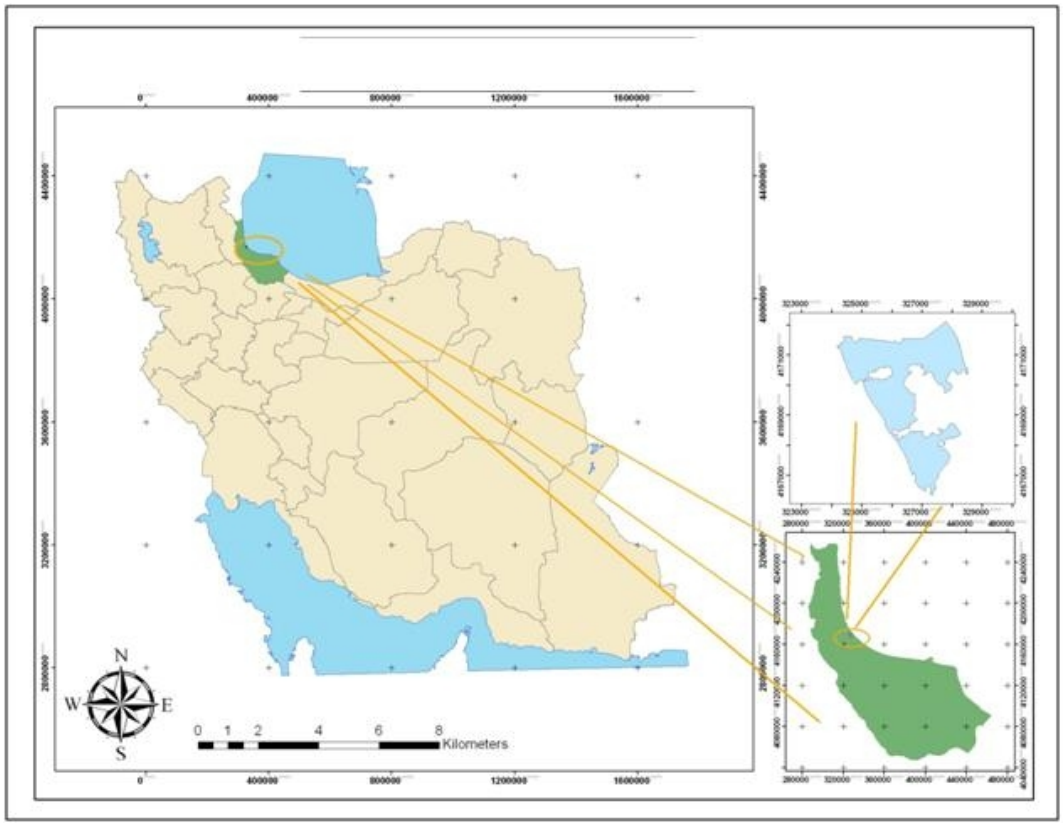

Fig. 1. View of study area.

Image classification: A technique for supervised classification is using maximum Likelihood. Stocker & Schiom (1997) suggested that this technique is more precise than other existing techniques. Quantities value of variance and correlation of spectral value of various bands were calculated for sample areas and same property is also used for relationship of an unclassified pixel to one group or spectral samples.

Field operation: In this stage training data was collected using GPS in the study area. After implementing GPS points on the image and drawing the ROIS, a report was provided by software as follows:

Resolution rate of the classes from each other is displayed. The more displayed number in each class is nearer to the number 2, it means that resolution has been performed well. Otherwise, selected classes are mixed.

Which during the classification process by mistake were entered to the class related to the given class, in fact they belong to their corresponding rows classes. These kinds of errors are called errors of commission or inclusion. Reliability of each class of classification image is obtained through dividing the correctly classified pixels of that class (in diameter) on the total number of pixels' (sum of the raw) classified as that class in the correctly classified image. This reliability is called user's accuracy (Table 1).

Table 1: Total precision of land uses in 1989.

Producer's Accuracy (%)	User Accuracy (%)	classes
0.78	**0.68**	**Pinus**
0.75	**0.64**	**Road**
0.71	**0.84**	**Mix**
0.61	**0.74**	**Building**
0.65	**0.80**	**carpinus**
0.79	**0.69**	**parrotia**
0.79	**0.65**	**Alnus**

Table 2: Kappa coefficient and total precision of ETM+ picture in 1989.

Kappa coefficient (%)	Total precision
0.724	0.731

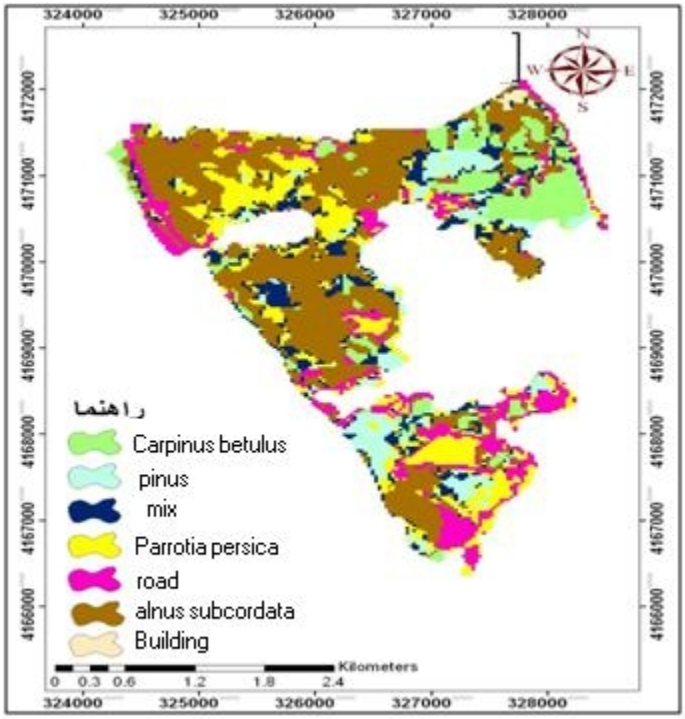

Fig. 2. Final classification map, 1989.

RESULTS AND DISCUSSION

Nowadays the most common technique to map the land use changes of the parks is using remote sensing technologies (Lefsky, Kohen, 2003). In table 3, the area of various classes in 1989 is displayed. Results of numerical classification of images by using maximum likelihood classifier and by participating various band sets indicated that in best conditions, total accuracy of image classification for 1989 is achieved as 0.7312. The reason of low accuracy of the images of 1989 can be attributed to presence of abundant mixed pixels in the pictures of 1989.

For example, in the areas with poor vegetation in the picture, it is possible that there is an arid area with a few tree bases, thus the recorded value for that pixel belongs to the result of the region without vegetation and the region with vegetation and don't belongs to the spectral value of an event. These pixels are called mixed pixels. In the maps drawn in 1989 also about 116 mixed pixels, in other words, about 37 h1 of study area didn't not classified correctly due to presence of these pixels which were defined and displayed in the final output.

Table 3. Distribution of land use levels for years 1989.

Images of 1989 Area(hectares)	Land class
92	pinus
109.8	carpinus
370.5	Alnus
237.5	Parrotia
113.5	Road
130.6	Mix
3.6	Buildind
1058	Total

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