

Ecological Based Planning of Forest Outdoor Recreation Case Study: Traditional Span of Mandj in Lordegan Forests-Iran

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Abstract: Forest is considered as one of the most important and most attractive recreation resources in nature which is the destination of most of the nature tourists. One of the most important ecologic usages of Zagros forests in west of Iran is outdoor recreation planning. In this study, using local multi criteria evaluation method, emphasizing on ecological criteria and combination of informational layers using Geographic Information System (GIS), forest based recreation planning in two forms of intensive and extensive in traditional span of Mandj in Lordegan city in Chahar Mahal and Bakhtiari province is studied and outdoor recreation desirability of areas are determined using weighted method. Also cooling power method of Biker was used for time evaluation of planning. Six (6) criteria including climate, soil, forest structure, water sources, shape of land and landscape, 12 secondary criteria and 36 indices were used in order to evaluate outdoor recreation ecologic ability of region. According to this investigation, 7 forest areas with total area of 6.3 ha are suitable for intensive outdoor recreation and remaining areas of this region (2476 ha) could be used for extensive outdoor recreation. Checking ecologic local criteria used in this study showed that water sources as a limiting factor, is a key exclusive factor in evaluating ecologic outdoor recreation power in this region. Also results showed months May, June, October, September, July and August are most suitable based on climate parameters.

Keywords: Ecological base planning, forest outdoor recreation, lordegan, spatial multi criteria evaluation

INTRODUCTION

Human life has been changing continuously since creation up to now. Growing population, Urbanization, industrialization, changing of moral and behavioral characteristics of people as well as changes such as increase of general knowledge and public health, increase of leisure and decrease of working time, all resulted in paying more attention to entertainment and outdoor recreation (Page and Thorn, 1997). People, especially the young are seeking for something to show off their power and characteristic and entertainment in general and outdoor recreation in special, give them opportunity to reach this goal (Nepal, 2002). Although securing food, clothing and shelter are of basic needs of mankind and are necessary to continue life, but man also needs satisfying emotional, psychological, educational and social needs. Entertainment and recreation are of emotional and psychological needs of every person which cause refreshment, relaxation and growth of talents (Inskeep, 1991; McCool and Moisey, 2001; Majnunian, 1995). Recreational activities have been found to have emotionally, intellectually, socially and physically positive effects on people (Turgut *et al.*, 2009). Sustainable development in various parts of a

healthy and productive society occurs when required coordination between economical and welfare programs is established (Murphy and Price, 2005) so conducting environmental plans, developing green areas and creating outdoor recreation and entertainment places for members of society to spend their free time is not out of these programs. It is not unreasonable that nowadays taking advantages of free times and entertainment is a part of life in developed countries (Frank, 2007; Hall and McArthur, 1991). All countries around the world, both developed and developing, are making policies to develop tourism industry to enjoy its various benefits especially its economical benefits (Rahimi, 2008). One of the most important parts and types of tourism having the greatest volume of this industry is natural based tourism. This kind of tourism which is along with environmental approach, so-called ecotourism, contains 30 to 40% of global tourism (Garrod, 2003; Soleimanpour, 2006). Natural tourism or nature based tourism is classified in 6 categories related to natural ecosystems as forest, mountain, steppe, desert, river and lake and beach and sea tourism (Daneshkar and Mahmoudi, 2008). All these ecosystems with a vast variety are dispersed in the country so our country is placed in the 5 first countries of the world according to

its natural touristic attractions (National Committee of Sustainable Development, 1998). In this direction, due to the importance of natural tourism and existing potentials of the country, creating background for its improvement and development is necessary. Forest tourism considering environmental regulations is the most demanded natural tourism, after sea and beach tourism (Kuvan, 2005; Stecker, 1996). One of the most important natural touristic resources of country is forests placed in 5 regions of Hirkani, Arasbarani, Zagros, Iran-Tourani and Khalij-Omani (Mahmoudi, 2005). Zagros forests are the widest forest of country with approximate are of 5 million ha and according to touristic aspect of natural regions that contains dynamic protection approach, forest tourism planning management is necessary for them (Mahmoudi, 2005). Finding outdoor recreation potentials for this kind of tourism is not only used as a device for developing economical and social level of native people of region, but also is considered as a tested managing approach in natural sources due to its protective outdoor recreation usage and prepares background of their dynamic protection (Harshaw *et al.*, 2005; Laurance *et al.*, 2005). So in this study it is tried to provide required background for Sustainable planning of forest based outdoor recreation in region using environmental planning management approach for tourism of natural places (Colin and Stephen, 2005; Xavier and John, 2002), considering ecologic abilities of forests of traditional span of Mandj. Aim of this study was to ecological capability evaluation of forests for intensive and extensive forest based recreations in Mandji region.

MATERIALS AND METHODS

Study area: Traditional span of Mandj, the study area is located in 45 km of west of Lordegan city in part of Mandj of Chahar Mahal and Bakhtiari Province. The villages of this region in Mandj are Mandj-Baraftab, Mandj-Nesa and Chahrub. Population distribution in these villages is 750, 625 and 70 people, respectively and these villages are located by 1 km distance of each other. Geographical coordination of region is: 49° 28' 40" to 49° 37' 00" of Eastern longitude and 31° 29' 41" to 31° 30' 30" of Northern latitude. Scope of region is 2482.5 ha and Lordegan River or Mandj River crosses beside of this forest region. By word "traditional span" we mean managerial ranges in natural source fields in which planning policy is protection of natural sources and generally cover traditional borders of rural areas (Forests and Watershed Management Organization, 2003). The study was carried out in 2010.

Study methods: In this review topographic maps of 1:25000 were used as basic maps. This study uses multi

criteria evaluation method for ecologic local parameters of forests, by optimal combination of informational layers using Geographic Information System (Fung and Wong, 2007; Sepasi, 2009). Criteria used in this study including climate, soil, forest structure, water resources and land shape were selected based on previous experiences (Makhdom, 2003; Maygoni, 2001; Ghanad Kar Sarabi, 1997; Karter, 2003; Rosa *et al.*, 2005; Sheng-Hshiang *et al.*, 2006; Wenjun, 2006) and in next step, after selecting sub-criteria of each criterion, its indexes are also selected and in overall, in this study 6 main criteria, 12 secondary criteria and 36 indexes that were compatible with features of region were used. Main and secondary criteria and related indexes are shown in Table 1. The procedure for selecting outdoor recreation zones was conducted after preparing ecologic resource maps by method of overlaying criterion's maps on each other (Maygoni, 2001) and lead to zoning of the under study region to outdoor recreation planning.

Numerical weighted method which had been tested previously in similar reviews of inside and outside of the country was used to determining the desirability of outdoor recreation regions (FAO, 1996; Majnunian, 1995; DanehKar and mahmoudi, 2008). In this way, in order to evaluate and determine the desirability level of outdoor recreation options, indexes of each criterion was weighted. For investigating and determining Comfort climate Tourism used Cooling Power method of Biker (Khaledi, 1994):

$$CP = (0.26 + 0.34V^{0.672})(36/5 - T)$$

In this study, physical power of the region under study was determined in the first step by identifying main and secondary criteria and effective ecologic indexes in investigating of forest tourism ability (Table 1) and then adding the layers of other criteria, ecological ability of region was obtained.

Physical zoning: The aim of physical zoning of outdoor recreation is to recognize primary potentials of outdoor recreation activities in the intensive and extensive forms. For physical zoning of outdoor recreation, unit topographic maps were used (Bozorgeian, 2002; Salkhori, 2003; Torabi, 2005; Rezvanfar, 2007). Unit topographic maps actually show macro ecosystems of each region which are obtained by putting altitude level maps, slope maps and geographical direction maps on each other. By multiplying the levels of these maps, the unit numbers of expected land topography of each region is obtained. If the obtained unit numbers are close to the expected unit numbers of land topography, the ecosystem richness of that region will be higher (Makhdom, 2003).

Table 1: Main and secondary criteria and related indexes

Score	Index	Secondary criteria	Main criteria
5	2.7 L/min	Volume of water for each hectare of outdoor recreation zone	Water resources
3	2 to 2.7 L/min		
1	<2 L/m		
5	<300 m in the center of zone	Distance access	
3	<300 m at side of zone		
5	Desirable	Water quality	
2	Somewhat desirable		
5	<5%	Slope	Land form
3	5 to 10%		
2	10 to 15%		
5	8 to 10 ha	Area	
3	4 to 8 ha		
1	<4 and >10		
5	Loamy	Texture	Soil
5	Sandy and sandy-loamy-clay		
3	Sandy- loamy and loamy-sandy		
2	Clay		
0	Heavy clay and hydromorphic		
5	Complete	Drainage	
3	Poor to intermediate		
0	Incomplete		
5	Intermediate	Grain size	
3	Intermediate to small		
1	Very small		
5	Deep	Depth	
3	Intermediate to deep		
5	75-50%	Canopy coverage	Forest structure
3	50-25%		
2	25-5%		
0	Without cover	View angle	Landscape
5	More than >10 km		
3	1 to 10 km		
1	<1 km	Depth of view	
5	180 to 360°		
3	45 to 180°		
1	<45°		

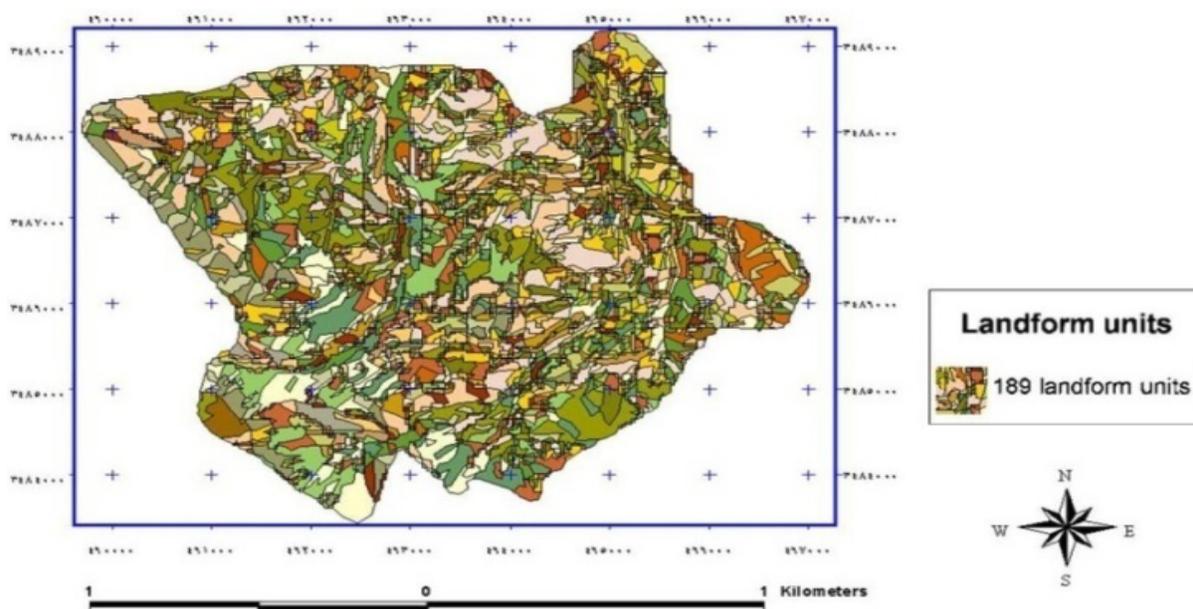


Fig. 1: Unit topographic maps of region

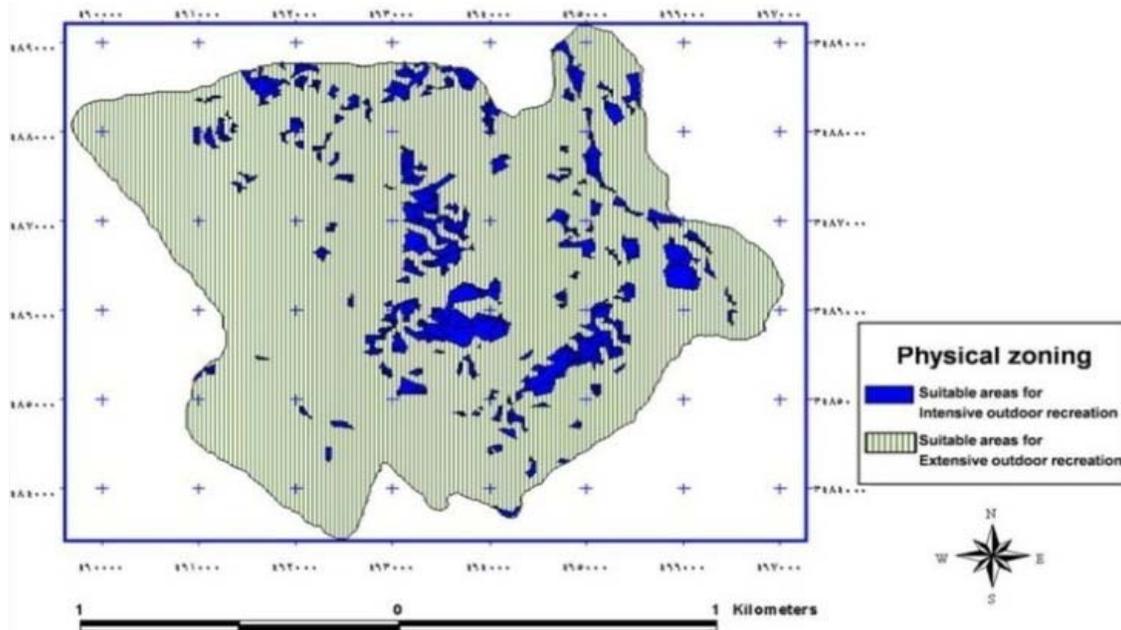


Fig. 2: Physical zoning

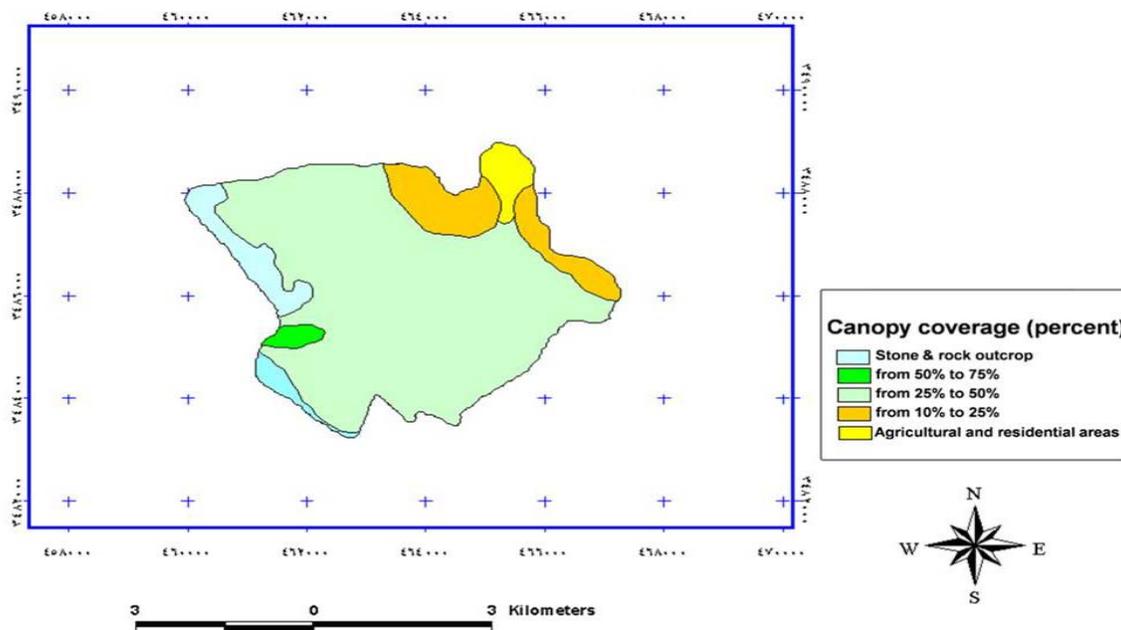


Fig. 3: Forest canopy coverage (percentage) map of under study

Since for preparing altitude, slope and geographical direction maps in traditional order of Manj 6, 5 and 9 levels were used respectively, 270 units of land topography are expected at region that just 189 units of land topography are available in region (Fig. 1).

Traditional span of Mandj is located on a mountainside and 90% of its area extends on northern

and eastern directions so had not any effect on physical zoning of outdoor recreation in this investigation and was not considered as secondary criterion. So based on the criterion of shape of land including slope and scope sub-criteria, physical zoning of outdoor recreation was conducted (Fig. 2). Based on this map that shows outdoor recreation zones in intensive and extensive

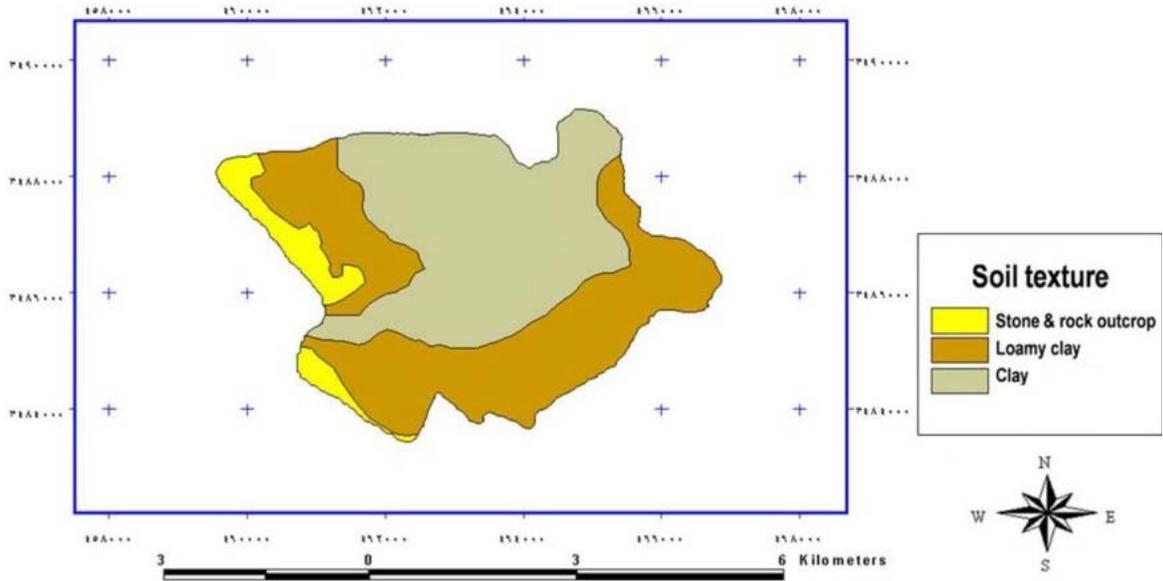


Fig. 4: Soil texture map of under study region

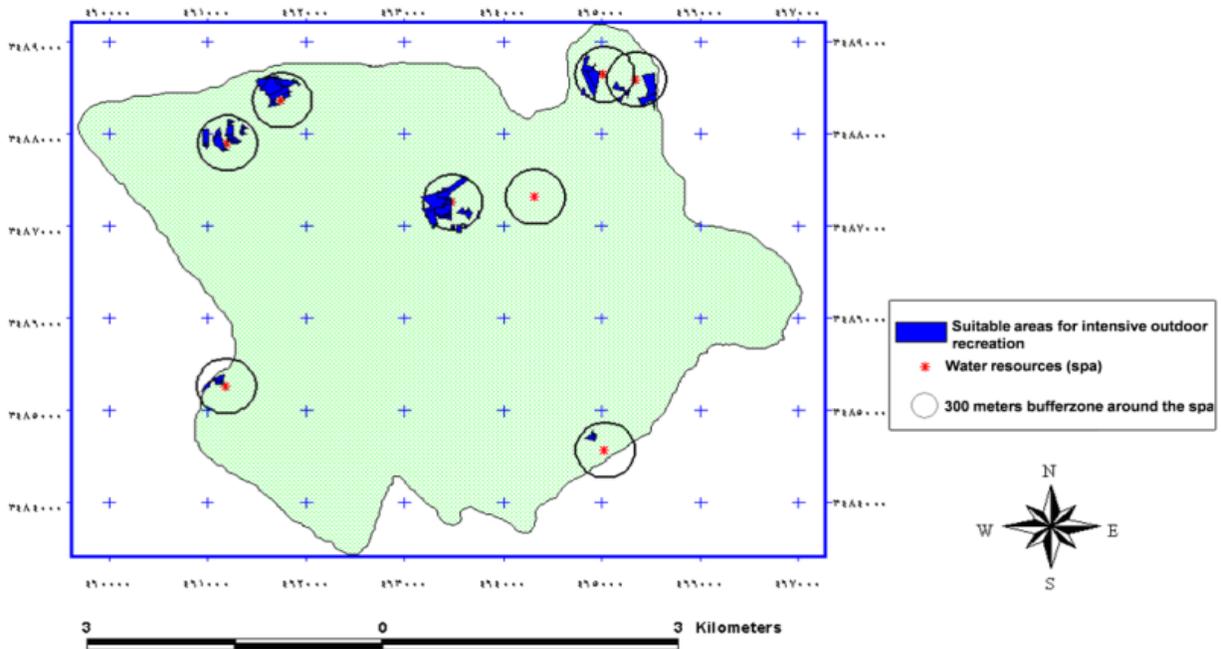


Fig. 5: Outdoor recreation ecological zoning map of under study region

forms, specified spots for intensive outdoor recreation zone had slope below 15% and northern and eastern directions and their area are more than 400 m² (it is not possible to create a outdoor recreation unit in spots less than this area) and the rest of region's area is suit forextensive outdoor recreation because of physical limitations for intensive outdoor recreation.

Final ecological zoning: For preparing ecological zoning, physical zoning map was combined with maps of tree crown cover percentage, soil texture and water resources maps (Fig. 3, 4 and 5) and final map of outdoor recreation ecologic power was prepared. Classifications of tree canopy coverage percentage status and soil structure based on sub-criteria and their

Table 2: Score status of each outdoor recreation zone

Main criteria	Secondary criteria	Zone 1	Zone 2	Zone 3	Zone 4	Zone 5	Zone 6	Zone 7
Soil	Texture	2	3	2	2	3	2	2
	Drainage	5	5	5	5	5	5	5
	Grain size	5	3	3	3	3	3	3
	Depth	5	5	5	5	5	5	5
Forest structure	Canopy coverage	5	3	3	3	3	0	0
Water resources	Volume of water	5	3	3	3	5	5	5
	Distance access	5	5	3	3	3	5	3
	Water quality	5	5	5	5	5	5	5
Land form	Slope	3	5	5	3	5	5	5
	Area	1	3	3	5	1	3	3
Landscape	View angle	5	1	3	1	5	3	1
	Depth of view	5	5	5	1	5	5	1
Sum		51	46	45	39	48	46	38

Table 3: Biker index evaluation in region

Desirability	CP value	Month
Undesirable	24	April
Desirable	15	May
Desirable	13	June
Desirable	17	July
Desirable	16	August
Desirable	17	September
Desirable	18	October
Undesirable	28	November
Undesirable	32	December
Undesirable	44	January
Undesirable	50	February
Undesirable	55	March

indexes did not cause any limitation for outdoor recreation planning in this study. According to Fig. 4, 7 zones around water resources considering an interval zone about 300 m (Ghanad Kar Sarabi, 1997) were assigned as suitable intensive outdoor recreation zones. Tree crown cover percentage status, soil texture and geology of region does not form any limitation for intensive outdoor recreation planning in region, so just criteria of water resources were used for zoning. Generally it is possible to say that 62955 m² (6.3 ha) of scope of traditional span of Mandj including options 1, 2 and 5, are suitable for intensive outdoor recreation and the rest of the area of this region (2476 ha) has no limitation for extensive outdoor recreation.

In this level, this question was formed that if identified locations all had same outdoor recreation desirability from ecologic point of view. In order to answer this question, selection of these zones were numerically weighted based on environmental criteria. Scoring for each of zones is shown on Table 2. In this table, total score values for each option was obtained according to presence of each index and score value. Based on obtained results, zones 1, 5, 2, 6, 3, 4 and 7 have the most desirability for intensive outdoor recreation zone planning, respectively in this region.

Comfort climate tourism: In evaluating ecologic power, beside local ecologic criteria more attention should be paid to the time factor which has a very

important role in natural tourism process. So ecologic evaluation process ends when limitations and climatic abilities of region also are considered which is known as climatic comfort (Saber Haghghat and Habibi Nokhandan, 2005). Table 3 shows results of Biker index evaluation in region for different months of year. According to this, months May, June, October, September, July and August have outdoor recreation preferences respectively regarding affecting climate parameters on outdoor recreation in region.

DISCUSSION AND CONCLUSION

Separating outdoor recreation regions into intensive and extensive forms is justifiable based on the types of expected outdoor recreation activities in each of outdoor recreation regions. In fact it is characteristics of outdoor recreation activities that determine type of effecting ecologic factors. Since expected outdoor recreation activities in extensive zones including forest walking, walking, climbing and visiting landscapes etc. which need no facilities and services except designing walking routes in special conditions (zones with high slope), just existence of water resources and recognition of dangerous zones such as sliding points, crags and wild life places are enough in evaluation level for specifying zones which are not suitable for intensive outdoor recreation. This case is different from previous studies such as Majlajpour (2001), Bozorgeian (2002), Salkhori (2003) and Torabi (2005) from this point of view. In the other hand, separation of intensive outdoor recreation zones into first and second classes in evaluating outdoor recreation ecologic power based on criteria like slope, direction and drinking water amount is not possible practically and it has never happened in any park or natural outdoor recreations of the country. Because in dividing intensive outdoor recreation zones based on what Makhdom (Makhdom, 2003) has claimed in his outdoor recreation ecologic model, the first and second classes where be placed beside each one and their separation is not practically possible due

to their similar conditions. Also slopes under 10% are considered as directionless which had been ignored in mentioned ecologic model. For this reason, intensive outdoor recreation zones should be considered as a unit polygon, although it is possible that regions inside each zone will not be similarly suitable for establishing outdoor recreation facilities. It is better for this to be done in intensive outdoor recreation zone planning level according to planning formats.

For this reason in this study intensive outdoor recreation zones considered as a unit in spite of previous studies of Majlajpour (2001), Bozorgeian (2002), Salkhori (2003), Torabi (2005) and Rezvanfar (2007). Reviewing unit topographic maps for outdoor recreation physical zoning in previous studies shows that practically outdoor recreation physical zoning is obtained by combining level maps of slope and geographical direction and altitude map is not useful. However altitude changes are effective on locating and planning of outdoor recreation activities. In this study shape of land units were used for checking the type of soil in region. Reviewing local ecologic criteria used in this study showed that water resources as a limiting factor, is a key factor for evaluating ecologic outdoor recreation power of this region. Outdoor recreation planning in natural zones such as forest, is the result of evaluating ecologic power and economical-social studies (Makhdom and Darvishsefat, 2004; Feich and Hall, 2000; Laurance *et al.*, 2005; Harshaw *et al.*, 2005). According to this point it is required that in order to complete planning process of forest based outdoor recreation in traditional order of Manj, effective economical-social criteria of region be detected and be used in final evaluation so that full efficiency of this outdoor recreation region would be obtained.

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