

Developing a Pattern for Ecological Monitoring in Central Zagros Forests (Case Study: Helen Protected Forest)

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Extended Abstract

Introduction

Forest ecosystems have continuously downgraded due to every environmental pressure including climate change, aerosols deposits, industrial pollutions and other degradation factors. The output soon or late would be a different forest. Forest monitoring is a well-regulated and usually long running procedure, which has the ability to detect these phenomena and reactions based on the aims it perceives and the principals it pursues. In international agreements, the ecological forest monitoring programs, which scheduled in twenty-first agenda of biodiversity convention, titled "continuous monitoring". As a result, countries have to commence initial studies as a duty toward international obligations.

Unquestionable ecological assignment of Zagros oak forests (preservation of biodiversity, soil and water) and their socio-economic and cultural features compels due to a sustainable management plan. To do that, present and futuristic information about the structure and function of these ecosystems is in need. As long as ecological monitoring of these forests implemented, the possibility of providing this information for sustainable forest management would be possible. Therefore, in this article based on an ecological monitoring program, we attempted to run a conceptual model to illustrate the expression, structure and function of the Central Zagros forests. The fulfillment of the model creates a framework for a long term planning and brings about the necessary information for ideal and sustainable management.

Material and Methods

Helen Protected Forest with an area about 40131 ha is located in Chaharmahal-va-Bakhtiari Province in Iran. The topography of the area is mountainous and altitudes are ranged from 1168 m in Paule Armand up to 3225 m in mountain peaks. The Climate is semi-humid with hot-dry summers and cold winters with average annual rainfall of 800-400 mm and mean annual temperature of 14°C. Range and forest lands covers 30 and 10 thousand hectares of Helen Protected Forest, respectively. The dominant tree species in the region is oak, but other trees and shrubs like Astragalus, Daphne and hawthorn can be seen. Human populations inside and around the region, are comprised of 12870 people which are settled in 31 villages.

The research has carried out in two stages, including the formulation of conceptual model and fulfilling the ecosystem-monitoring program. A combination of library searches as well as field excursions generating an acceptable understanding of the region and clarifying the project goals. With the prevailing conditions in the region, in the second stage, descriptive and comparative analysis formulated the appropriate model.

In the design phase of the program, monitoring and component determination have been carried out based on successful studies in other countries. Regardless of the type of the source, ecological monitoring program in general is consisted of target determination, monitoring indices and stations. In this study, with respect to the issue of forest monitoring, several stations have been assigned and implemented, as it illustrated in Figure 1 and Table 1 to determine the matching and other components.

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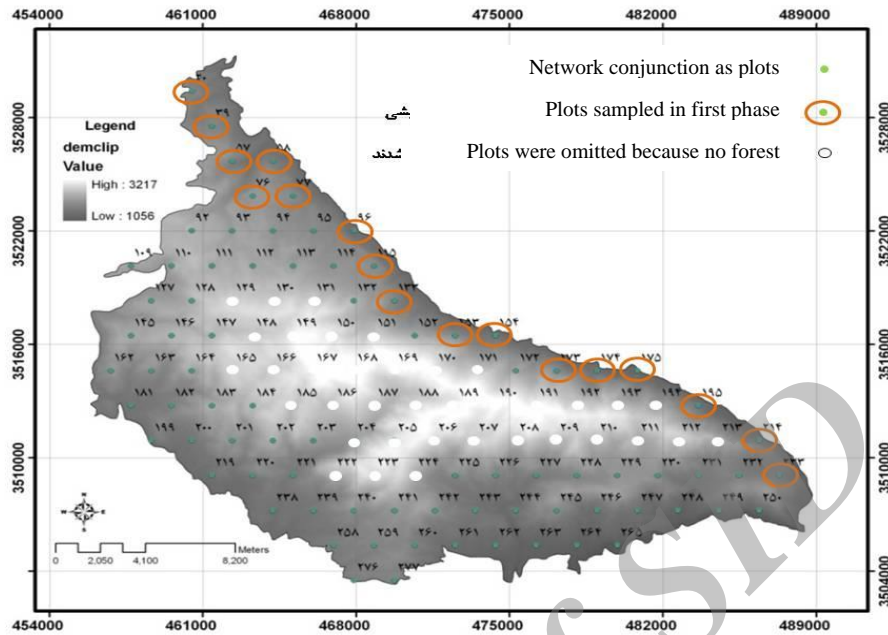


Fig.1. Locations of monitoring stations in the first stage of the forest survey

Table 1. Components of ecological monitoring of Helen Protected Forest based on different targets

Monitoring targets	Monitoring indices	Monitoring methodology	Monitoring Frequency
Forest area change	Common metrics in landscape scale (number of patches, patch average size, patch penetration and scattering)	The appropriate remote sensing images (Landsat) and use of software FRAGSTAS	Every four years
Changes in forest density	Plant indices, such as NDVI and MSAVI	The appropriate remote sensing images (Landsat)	Annually
	Tree number per area unit	Direct tally in plot	Annually
Forest health	Infested tree number in plot	Direct tally of infested trees in plot	Annually
Forest biodiversity	-Tree species richness and abundance of herbaceous, shrub, and forest floor plants	-List of tree and shrub species and their abundance in plot	Annually
	-Ground insect species richness and abundance	-List of herbaceous plant and their frequency in micro-plot	
	-Forest birds species richness and abundance		
Forest growth and yield	-Diameter at breast height and crown diameter -Volume in hectare	Caliper and tape	Every four years

Results and Discussion

Based on the socio-economic and ecological conditions, prevailing in the region, a conceptual model is formulated for Helen Protected Forest. The dominant functional relationship between the various components and their monitoring programs is expressed in accordance with the plot locations and the indicators. Due to lack of repetition, these may not be the actual monitoring results, but as a pilot for the original calibration program are quite useful to understand the status quo. Surface area, density and health of canopy measurements showed a density of seven trees per plot and 25% foliage cover. In addition, 10 out of 17 plots had signs of infestation,

which were mainly because of oak leaf eating caterpillars. In average, 55% of the oak trees were infected to ticks, aphids or cicadas.

The numerical value of the tree and shrub species diversity, in accordance with the index of Shannon-Wiener, was equivalent to 0.4 and correspondent value for bushy and herbaceous species was 3.4.

The rate of growth and the production of trees and forests can be established by measuring changes in breast height diameter and the tree crown diameter until the next monitoring period. This is done by special relationships. Based on the monitoring pilot phase, what can now be said is that the 46.62 percentage of diameter 10-35.4 cm class implies that forest has been under pressure of clear cutting in the past.

Long term ecological monitoring in Zagros landscapes creates a promising opportunity for managers, decision makers and researchers in the field of natural resources to collect and verify data for dynamic environmental policies. Since there are records of numerous failures in long term monitoring in landscape scales, the necessity of proper understanding, especially in inter-components competence, is inevitable to avoid unwanted costs. Although the results in this study come from a portion of the protected forest where was more reachable, but the model outcome showed that destructive factors like understory cultivation create a hostile conditions for forest dynamic growth. Overgrazing and charcoal exploitation are the problems everywhere in the region. Therefore, the study recommends the expansion of the ecological monitoring to all over the protected area.

Keywords: conceptual model, Chaharmahal va Bakhtiary Province, ecological monitoring, Helen Protected Forest.

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