

Received: 13-Mar-2015

Accepted: 06-May-2015

## Evaluation of Some Morphological, Phytochemical and Ecological Characteristics of Different Populations of *Satureja rechingeri* Jamzad

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### Abstract

*Satureja rechingeri*, an endemic species from Iran, is distributed in narrow habitats in Ilam and Khuzestan provinces. This study was conducted in 2013 and some morphological characteristics, oil content, rosmarinic acid content and ecological features of different populations of *S. rechingeri* were studied. Identified habitats of *S. rechingeri* are located in sub-tropical areas of Ilam and Khuzistan provinces, within 32-33° longitude and 46-49° latitude and the plant mainly grows on calcareous rocks in the northern and southern slopes. The highest coefficient of variation among the traits of *S. rechingeri* was obtained for leaf surface area (43.01%) and the lowest (9.25%) was obtained for the diameter of the calyx. The coefficient of variation for essential oil yield was 33.71%. The lowest (2.1%) and the highest (3.51%) average essential oil yields were observed in *Kaver* and *Lives* populations, respectively. Minimum (0.93%) and maximum (6.2%) essential oil yields were observed among the individuals of the *Lives* and *Kaver* populations, respectively. Highest (54.49%) coefficient of variation for rosmarinic acid content was observed in *Bone Adab* population. Amount of rosmarinic acid of methanolic extract of under study populations showed high variability and varied from 0.54 to 7.29% among individuals, while the average rosmarinic acid in populations varied from 1.62 percent (*Kaver* population) to 4.14 percent (*Zarrin Abad* population). Diversity of *S. richingeri* within populations was higher than among them showing limited segregating of populations.

**Key Words:** *Satureja rechingeri*, Natural habitat, Morphology, Rosmarinic acid, Oil content

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Received: 26-Aug-2013

Accepted: 18-Sep-2013

## Heavy Metals (Pb and Ni) in Soil and Plant *Halimocnemis pilifera* in Halgheh Darreh Waste Disposal Site in Karaj

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### Abstract

This study was conducted in *Halgheh Darreh* waste disposal site in Karaj in order to determine the concentration of Ni and Pb in *Halimocnemis pilifera* and in region's soil. Three 50\*50 m plots in the direction of the prevailing wind were selected. The First plot was close to the leachate ponds and the next two plots were located at 500 and 1000 m from the first plot, respectively. Ten random samples from root and shoot of the plant and also from the soil were collected. The concentrations of the metals were determined using a flame atomic absorption spectrometry (AA 240 (FS) Varian Company, USA) after dry acid digestion. Two-way and one-way ANOVA were used to assess the differences of metal concentrations in roots and shoots of the plants, and in the soil of the plots, respectively. Duncan Test was applied to compare the average concentrations of metals in different plots. The results revealed that the soil of the different plots do not have a significant difference in Ni and Pb concentrations. No significant difference was observed between the metal concentrations in roots and shoots of the plants. The plants in the second and third plots showed to have the highest concentration of Pb (3.27 mg kg<sup>-1</sup>) and Ni (4.41 mg kg<sup>-1</sup>), respectively. Bioconcentration and transmission factors for Ni and Pb (TF=1.21; 0.75 and BCF=1.11; 0.29, respectively) suggested that *H.pilifera* is an appropriate plant to remove Pb and Ni from soil.

**Key Words:** Soil Pollution, Plant *H.pilifera*, Heavy Metals (Ni, and Pb), Waste Disposal Site, *Halghe Darre*

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Received: 17-Sep-2014

Accepted: 13-Jul-2015

## Analysis of Gully Morphometry in Relation with Physical and Chemical Characteristics of Soil in *Kojur, Noushar, Mazandaran Province*

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### Abstract

Gully erosion is one of the most destructive types of hydraulic erosion and an important process in soil destruction that in some cases creates long, vast, deep canals. Study area was located in the northeastern *Alborz, Mazandaran* province and *Nowshar* County (*Firozkola* subbasin a portion of *Kojur* watershed). This paper examines gully morphometry in relation with physical and chemical characteristics of soil. The morphometry of gullies such as width, depth and slope were determined in field. Physical and chemical properties of soil such as exchange cation (EC), organic and inorganic carbon, soil acidity and soil texture were determined in the laboratory. Data analyses were performed by Detrended correspondence analysis (DCA). The DCA analysis indicated that the width and slope are correlated with OC and clay negatively but they have positive correlation with pH. Hence, it's expected that following reduction of OC and clay and an increase in PH, gully width boosts. Besides, if EC increases and  $\text{CaCO}_3$  decreases, depth and w/d ratio of gully will increase.

**Key Words:** DCA analysis, Gully erosion, Morphometry, *Kojur*

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Received: 22- Dec- 2010

Accepted: 27- Dec- 2011

## Runoff Estimation of Urban Catchment Using URBS-UH Model (Case Study Baharestan City)

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### Abstract

Quantification of urban hydrologic response of catchments to rain fall is one of the most important issues in urban hydrology. Despite its importance, there is scant information by means of which required data can be obtained for quantifying hydrologic response. In this study, urban database was developed for a part of Baharestan City in Isfahan Province and using the information, the urban unit hydrograph was determined through URBS-UH model for two catchments of Baharestan. Peak of hydrograph of the first and second catchment was estimated  $0.0727\text{m}^3/\text{s}$  and  $0.096$ , respectively. Flood hydrograph of some rain occurred previously in Baharestan was determined through the unit hydrograph. Peak discharge of flood was also measured and the efficiency of the developed model was examined based on the peak information. Nash–Sutcliffe coefficient of the first and the second catchment were estimated  $0.89$  and  $0.79$ , respectively. The developed model showed good to very good performance in the pilot area.

**Key Words:** Urban hydrology, Unit hydrograph, URBS-UH model, Baharestan.

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Received: 11-May-2013

Accepted: 24-Sep-2013

## Impacts of Large-Scale Climate Signals on Seasonal Rainfall in the Maharlu - Bakhtegan Watershed

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### Abstract

Predicting climate trends, especially forecasting rainfall, provides managers of different fields with suitable tools so that considering these predictions; they can devise future-state policies. At this study, after selecting the most effective climate indices applying PCA method, the effects of large-scale climate signals in seasonal rainfall of basin Maharlu - Bakhtegan were investigated both simultaneously and by delay through statistical methods (Pearson correlation and cross-correlation coefficient) and by applying stepwise regression model, regression equation for forecasting rainfall was offered. The results showed that in cross-correlation between the time series of SPI (dependent variable) at time (t) and climate signals (independent variable) at time (t-k), only SOI index concurrently has a significant relationship with rainfall, whereas, most of indices turned significant with standardized precipitation index with different lag times. In season to season study of the signals with the standard precipitation index using Pearson's correlation coefficient it was found that climate signals of spring and summer are not significantly correlated with SPI. Representation coefficients ( $R^2$ ) and standardized regression effect (Beta) in stepwise regression model showed that simultaneous and with season to season delays signals (for example: SPI index of autumn with four previous seasons indexes) at method Pearson correlation have higher relationship with seasonal standardized precipitation index than the cross-correlation in time (t-k), (which signals of all seasons given is delay together with than SPI of all seasons) show.

**Keywords:** Seasonal Rainfall, Principal Component Analysis, Maharlu - Bakhtegan watershed, Large-scale climate signals, Cross- correlation

Received: 22-Jul-2013

Accepted: 22-Sep-2014

## Comparison of Neuro Fuzzy, Neural Network Artificial and Statistical Methods for Estimating Suspended Load Rivers (Case Study: Taleghan Basin Upstream)

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### Abstract

Estimation of fine suspended load rivers is important in designing reserves, transition volume of sediment, and estimating lake pollution. Thus, some methods are needed for determining damages caused by sedimentations in environment and determining its effects on the watersheds. There are many methods for estimating suspended load, one of these methods that solves the problems of sediment discharge and can predict it is using Neuro fuzzy or ANFIS (Adaptive Network Fuzzy Inference System), and ANN (Artificial Neural Network) methods. These make a function between sediment and simultaneous discharge by use of different algorithms. The goal of this research is comparing the effectiveness of Neuro fuzzy, neural network artificial and statistical methods for estimating suspended load river in Glinak station of Taleghan Basin. It was found out that suspended load estimations of Neuro fuzzy method with MAE 1006 ton/day, and correlation efficiency (R) 77%, RMSE 2621 ton/day and Nash-Sutcliffe error (NS) 0.51 is better than Neural Network Artificial and Statistical methods and Artificial Neural Network method rather than Statistical Method are more proper. Also, contracting both neural networks artificial to fuzzy laws can be illustrated better than other methods, variation of sediment Load River. One more merit of this method is that it is not sensitive to few errors in early statistical data and this fact enables better estimation of neural network model in comparison with statistical model. Finally, Neuro fuzzy method works better as the percent of train data to test data increases.

**Key Words:** Neuro fuzzy, Artificial Neural Network, Suspended Load, Statistical Method, Taleghan.

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Received: 30-Dec-2012

Accepted: 27-Apr-2013

## Mineralogy Investigation of Sediments of Riverbed in *Shafarood* Watershed, *Gilan* Province for Determining the Rate of Erosion and Sedimentation

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### Abstract

More accurate understanding of rock formations and sedimentary units sensitive to erosion will enable us to present appropriate and timely methods in order to prevent accelerated erosion. In this study, through predefined sampling from main and minor channels and granulometric analysis using index sieves, mineralogical investigation has been performed qualitatively and quantitatively by binoculars in laboratory. After that, sedimentation potential has been calculated by using practical formulas. Then, sedimentation potential of each sedimentary unit has been estimated from average results of sedimentary sample and with this method, sedimentation potential of *Shafarood* Watershed has been obtained from average results of five sub basins. An equation has been calculated for each sub basin and by this, an equation for whole watershed was presented. In this equation, the Y which refers to the amount of delivered sediments has been placed in one side and rock unit coefficients on the other side. The coefficient of each rock unit has a rule in sediment production. These coefficients are dimensionless and demonstrate rock unit sensitivity to erosion. The bigger this value, the more sensitive that rock unit is to erosion. In this way, the map of sensitivity to erosion for each sub basin has been prepared by using (ARC GIS) software. According to average sedimentation potential of *Shafarood* Watershed, marl units (Pgf), silty sandy shale (Jsh) and sandy limestone (Kusl), have respectively the highest sensitivity and limestone units (P), andesite - basalt (Pev) and tuff shale (V) have the least sensitivity to the erosion.

**Key Words:** Sediment mineralogy, Predefined sampling, Index sieves, Binoculars, Rock units, Sedimentation potential, Sensitivity to erosion

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Received: 23-Jan.-2013

Accepted: 3-Feb.-2013

## Assessment of Development Impacts in Land Use and Land Price Changes (Case Study: Taleghan Dam)

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### Abstract

Development impact assessment is key to achieving a comprehensive planning aligned with land sustainability. In human and natural systems studies, changes can be simultaneously examined in two different systems. The purpose of this paper is to understand the effects of dam construction on land prices and land use change in nearby villages of Taleghan Dam. Descriptive - qualitative statistics were used in this research and library and field methods were used for collecting the required information. In order to specify the land value of the four villages of the area of the dam for four decaes, based on the prices of the year 1390, the land vlue formula was applied. Also, TM satellite images of 1379 and 1386 were used for pinpointing land use changes. The results of these studies indicate that dam construction in 1380s and 1390s increased land price significantly and changes in land price affected upon land use changes in nearby villages of dam and the price of land in the *Zydasht* village overlooking the dam increased dramatically. Based on the results of this research, it can be stated that the dynamics of the land use of the area was affected by land price that for achieving sustainability in the watershed, an effective law must be enforced to prevent land degradation and control land prices.

**Key Words:** development impact assessment, sustainability of land, land use changes, land prices and Taleghan Dam



Received: 18-Dec-2013

Accepted: 29-Oct-2014

## Developing a Decision Support System for Evaluating and Managing Rangeland Ecosystems (Case Study: Semi-Steppe Rangelands of Feridan- Isfahan)

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### Abstract

This study sought to develop a Decision Support System (DSS) for assisting range managers to detect range condition and make informed decisions about Feridan County rangelands. All plant species frequencies were measured in 31 range sites with various grazing histories using step point method. Four hundred points along four perpendiculars 30 meters transects were measured in each site and grazing indicator species were identified using grazing gradient analysis. The range conditions of the sites were determined by evaluating the frequencies of indicator species along grazing gradient using Resource Environment Data Information System (REDIS). The best management practices and ecological interpretation for each range condition classes were then inserted into the REDIS model. The end users can import the indicator species frequencies of a selected site into the REDIS model and obtain the required information about range condition class, ecological information and management options. According to the results, the frequencies of six range species in the study area can appropriately determine range condition classes quantitatively. The model performance was then evaluated by comparing the range condition classes of 12 independent sites by REDIS model and 'Four Factors' method. The REDIS model had an accuracy of 91 percent. The managers can save the condition position of a selected site along a condition gradient in REDIS model; hence they could simply monitor the range condition changes of the studied site.

**Key Words:** Decision support system, Indicator species, Grazing gradient, Resource Environment Data Information System

Received: 30-Aug-2013

Accepted: 11-Jan-2015

## Investigation of the Effect of Storm Occurrence Time on Prioritization of Factors Affecting on Erosion Using WEPP Model Sensitivity Analysis (Case Study: Shanganeh Watershed, Khorasan Razavi Province)

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### Abstract

WEPP model needs a great deal of input data. Identifying the model's sensitive parameters and their prioritization increases the accuracy and efficiency of the model. On the other hand, WEPP model can simulate processes affecting on runoff, erosion and sediment throughout the year. Thus, model sensitivity must vary based on the storm occurrence time and parameters value in different sections of the year. To prove this assumption, two spring and autumn storm events related to 2008 were selected and sensitivity analysis of the WEPP model was done in three plots with different conditions in Sanganeh watershed. For sensitivity analysis, the OAT method was used and sensitivity degree of parameters was calculated. Obtained results show that the rate of sand is the most sensitive parameter of WEPP model. This parameter was followed by other parameters like clay percent, effective hydraulic conductivity, height and intensity of rainfall, day degree of growing, growing season and percent of growing season when leaf area index decreases. Most variations are observed in prioritization of sensitive parameter in the plant/ management file. In most cases, sensitivity degree of these parameters in autumn event comparing to the spring event has significantly reduced in all plots. In general, obtained results show that the rate of sensitivity of the WEPP model to different parameters varies during the time. Hence, for using this complex model in regions with data limitation, the user must be aware to this issue that regarding storm time, which parameter is more sensitive in the pilot area and need to be carefully measured in the field.

**Key Words:** WEPP Hillslope Model, Sensitivity Analysis, OAT method, Sensitivity Degree, Prioritization, Sanganeh Watershed.

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Received: 02-Jun-2013

Accepted: 17-Sep-2013

## Drought Monitoring Using Vegetation Index (NDVI) (Case study: Rangelands of Ilam Province)

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### Abstract

To identify an appropriate index for monitoring and evaluation of drought, rainfall data obtained from meteorological stations of Ilam Province from 2000 to 2011 and MODIS satellite images with 16-day intervals were collected and processed. The Standardized Precipitation Index (SPI) was calculated based on rainfall data; therefore, the rainfall data were used for measuring SPI and satellite images were used for calculating NDVI. Also, the percentages of canopy cover in range types were selected from the information of the National Evaluation of rangelands in different climatic zones. The correlation between SPI and NDVI and also canopy cover and NDVI was examined. The relationship between vegetation index (NDVI) and SPI was determined by regression. The results of SPI showed that in 2000 a severe drought and in 2006 a medium wet occurred in rangelands of Ilam Province. NDVI value variations have as well confirmed it. The results showed that NDVI and life form (annual forb and annual grass) has the highest percentage of correlation. Also examining of result showed that most correlation of SPI and NDVI was in 3 and 6-months intervals. Evaluation of regression models performance in range types described that models in 3 and 6-months intervals was suitable for monitoring drought. The result of regression confirmed that NDVI was an appropriate index for monitoring and assessment of drought.

**Key Words:** drought, Standardized Precipitation Index, Normalized Difference Vegetation Index, regression, Ilam, Rangeland

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Received: 06-Jan-2014

Accepted: 06-Apr-2014

## Analysis of Policy Network and Organizational Cohesion of the Stakeholders of Natural Resources of *Semnan* Province

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### Abstract

Achieving integrated natural resource management fundamentally needs effective and coordinated relationship, collaboration, and synergy among various actors who have common but different responsibilities. In this sense, the foundation of comprehensive and integrated management is not compatible with centralization and top-down strategies. The aim of this paper is analysis of network and organizational cohesion of natural resources stakeholders in *Semnan* province. In this study, relations of existing organizations within the network have been investigated based on inter-organizational information transfer and collaboration through social network analysis method and applying macro-level and middle indexes of institutional network including; the network size, density, ties reciprocity, and centralization at macro-level and core-periphery index at middle level. Policy monitoring emphasized in present paper's title refers to this question that how successfully natural resource integrated management policies have been realized at least within the fourth and fifth development programs. Therefore, present study is an attempt to address this question quantitatively and relying on the results of indexes of structural analysis of natural resource stakeholders' network in the pilot area. The results of this study indicate that institutional cohesion is 40 percent (poor) and sustainability of institutional network based on reciprocity is about 47 percent (medium). Additionally the core-periphery index showed that the density of institutional network of Semnan province in core actors' subgroup is 77 percent and in periphery actors' subgroup is 25 percent. Research findings identify existing capacities for applying integrated natural resources management and reveal the necessity of reducing network centralization and strengthening the relationship among various stakeholders of this section.

**Key Words:** Organizational cohesion, network analysis, decentralization, integrated natural resources management, *Semnan* province

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Received: 11-Jan-2011

Accepted: 17-Oct-2011

## Assessment of Forest Roads Sediment Yield using WARSEM, SEDMODL and Direct Measurement through Rainfall Simulation

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### Abstract

In this study, the sediment yield of forest roads of Darabkola watershed was investigated and estimated using WARSEM and SEDMODEL. Rainfall simulator was applied to measure the sediment of abovementioned roads directly. In order to apply WARSEM and SEDMODEL models, field operations for measurement of different parameters including road length and width, height and coverage of road cut-slope, road longitudinal slope, shape and configuration of the road, road surface, and etc. were carried out in 63 different segments of the path of forest roads in the study area as 11979 meters long. Then sediment yield of roads was measured by rainfall simulator with nozzle of 3 meters high and plot of 2 square meters. Results of the WARSEM and SEDMODL models and rainfall simulation showed that sediment yield of forest roads are equal to 9.918, 5.109, and 4.141 kg/m<sup>2</sup>/year, respectively. Results also showed that there was no significant difference between sediment yield of rainfall simulation and SEDMODEL at significance level of %95. It was also revealed that SEDMODL is more suitable for estimating sediment yield of forest road with values of RD, MD, BIAS, RE and RMSE equal to 21.42, 4.54, 0.04, 17.59 and 0.71, respectively.

**Keywords:** Sediment yield, Forest roads, Rainfall simulator, WARSEM, SEDMODL

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Received: 28-Jul-2014

Accepted: 30-Dec-2014

## Applying Landscape Function Analysis Method in Order to Assess the Ecological Function of Plant Patches in Rangeland Management Treatments (Pilot: *Kojour Noshahr* Rangelands)

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### Abstract

Assessment of rangeland ecological characteristics have been proposed as an important factor in reviewing and monitoring the effects of various management measures and it demands different tools for quantifying and offering a reasonable criterion for comparison of different managements. For this purpose, the Landscape Function Analysis (LFA) method is capable of displaying the structural and functional status of pastureland with considering the basic and simple indicators and it can be resorted to as a basis for selecting optimal and sustainable management. In this study, it was found out that among different types of pasture management in *Kojour Noshahr* including; enclosure, grazing, plowing and planting management - in almost identical conditions regarding plant types, animal types, soil, geology, and climate the enclosure management was significantly ( $P<0/05$ ) more favorable than other kinds of managements in terms of structural and functional features and it was followed by planting and grazing. Meanwhile, the plowed pastures were significantly unfavorable ( $P<0/05$ ) both in terms of structural features and functional characteristics. Therefore; enclosure can be a perfect option to protect rangeland resources in this region.

**Keywords:** Rangeland, Health assessment, Ecological function, LFA, *Kojour Noshahr*.

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Received: 5-Feb-2011

Accepted: 24-Dec-2011

## Comparison of Effective Factors on Landslide Hazard in Two Spatial Scales through Multiple Regressions (Case Study: Taleghan Watershed)

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### Abstract

Landslide occurs inevitably and naturally in many slopes due to sensitive formations, moisture, and other factors. Taleghan watershed is prone to landslide due to the presence of huge Miocene marl masses. After construction of Taleghan reservoir dam, moisture and ecological condition of the region changed. In this paper, factors impacting upon landslide hazard (slope, aspect, hypsometry, geology, land use, distance to road, distance to lake) were studied and their role and importance on this phenomenon were verified in a large (maximum distance of 1500 meter from lake) and a small (maximum distance of 450 meter from lake) spatial scale. Thus, GIS maps of the above mentioned parameters were provided using satellite and aerial images and field activities. All maps were crossed with a resolution of 100m\*100m. It was found out that the distance to the lake didn't influence upon landslide in a large spatial scale but it falls effective as the distance to the lake reduces. In fact lake has a local effect and mostly influences at maximum 200 meter distance.

*Keywords: landslide, multi-variate regression, hazard zonation, Taleghan*

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Received: 06-Mar-2015

Accepted: 05-Jan-2016

## Applying FTOPSIS in Prioritizing Biological Management Scenarios of Watershed Resources (Case study: Dare Nari Sarvestan Watershed, Fars)

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### Abstract

The development and implementation of practical natural resources and catchment management policies require a comprehensive knowledge of the system processes (biological, physical, and socio-economic), their complicated interactions, and how they react to different changes. The current research assessed the ecological, physical, and socio-economic consequences of biologically-based management scenarios targeting runoff and soil erosion problems in the *Darenari* catchment. The *Darenari* catchment with an approximate area of 554 ha is located in Fars province, Iran. Three biological activities and 8 management scenarios were considered. Ecological consequences were studied using the weighted land cover area index (WLCAI). Physical effects were investigated applying the runoff curve number (SCS-CN) hydrologic model. Economic and social effects were assessed applying the cost/benefit analysis as well as examining the outcomes of a social survey. Then, a fuzzy AHP approach was applied to weigh the criteria and ultimately, the best management option was chosen using FTOPSIS model. The results showed that social criteria with the highest weight and scenario No 8 was the best scenario and had first priority. The results indicated that the multi-criteria decision making techniques included capability of expressing different aspects of the problem and are the perfect tool for watershed resources management.

**Keywords:** Biologic management scenarios, *Dare Nari* watershed, Fuzzy Multiple-criteria decision making, Watershed management.

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Received: 06-May-2014

Accepted: 14-Apr-2015

## Vegetation Changes Procedure Inside and Outside of Enclosure in Tanglaybid Rangelands of Yazd Province (2000-2005)

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### Abstract

Grazing animals affect rangeland vegetation structure and function both directly and indirectly. These effects can be assessed in enclosures. In this study, vegetation changes inside and outside of enclosures of Tanglaybid rangelands, located in south-western part of Yazd province, have been investigated. Vegetation changes study was carried out in 3 key areas inside and also 3 key areas outside of enclosure and lasted for 5 years (2000-2005). Every key area included 3 transects of 100 meters long and 40 meters intervals. The transects were selected vertical to slope, including 10 fixed plots ( $2 \times 1 \text{ m}^2$ ). Vegetation cover, density and frequency percentage of each plot species were measured annually. The random- systematic method was applied as a sampling method. Vegetation changes inside and outside of enclosure were assessed, in a completely random plan, applying Duncan's test ( $P < 0.05$ ). The results showed that vegetation cover percentages increased significantly ( $P < 0.05$ ), inside the enclosure comparing to outside of it. Mean coverage of annual and perennial grasses and also bushes, inside the enclosure comparing to its outside increased 47, 38 and 7%, respectively. Thus, in present research, enclosure has positive effects on vegetation cover changes of several species. Frequency percentage results showed that there was no significant difference, inside against outside the enclosure in 2000, 2001, 2002, 2003, and 2004. Regarding density, there was significant difference only in 2001. The results can be considered in future management of the area's rangelands and similar regions throughout Iran.

**Key Words:** Canopy Cover, Tanglaybid, Grazing, Enclosure, Rangeland, Yazd

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Received: 23-Nov-2013

Accepted: 23-Dec-2014

## Classification of Vegetation and Its Ordination Regarding Geologic, Physiographic and Edaphic Factors (Case Study: Manesht Protected Area, Ilam, Iran)

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### Abstract

This research aimed at studying the vegetation and investigating the effects of physiographic, edaphic and geological factors upon distribution of plant communities in Manesht district in Ilam province. Sampling was done based on plant types and land unit map. The number of samples was determined by Krebs method. In total, 125 square sampling plots of  $400\text{ m}^2$  area were selected by random systematic method. To determine soil factors, two soil samples (0–30, 30–90 cm deep) were collected from each land unit and physico-chemical parameters were measured. Using TWINSpan, vegetation of study area was classified and then PCA and CCA were used to investigate the relationship between vegetation and environmental factors. Based on TWINSpan, four vegetation groups were recognized. According to TWINSpan results, four ecological groups were identified that first and second groups with 31 and 46 sample plots, respectively and by *Quercus barantti*, *Crataegus pontica* and *Acer monspessulanum*, as indicator species, are more calciphiles than another groups. The first three axes of the PCA accounted for 62.83%, 23.45% and 13.72% of the total plant cover variability, respectively. Also based on Mont Carlo analysis, first and second axes with 0.68 and 0.48 eigenvalue, accounted for 28% and 19% of the variability, respectively and the correlation coefficient of axes and species is 0.98. According to PCA and CCA, Formation, organic matter and lime were the most important factors on establishing of ecological groups.

**Keywords:** Canonical Correspondence Analysis, Manesht protected area, Principal Components Analysis, Two-Way Indicator Species Analysis

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