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Desertification monitoring in Garmsar plain with emphasis on water and agriculture criteria

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ABSTRACT

In management, the monitoring means systematic collection and storage of data from activities and strategies that provide assessment and report about the overall condition of the study area. In this research, among different existing methods, IMDPA model was selected for monitoring desertification in Garmsar plain. Based on the study area two criteria including agriculture and water were selected as the main effective criteria on desertification and desertification intensity was evaluated on the basis of seven indices including: groundwater table fluctuation, electrical conductivity, sodium absorption ratio, agricultural mention cropping pattern, agriculture yield according to land suitability, irrigation method and highly inappropriate utilization of machinery, fertilizer and pesticide chemicals. The results showed that the average weights of agriculture criterion were 2.17 and 2.27 in 2002 and 2011 respectively classified in medium class of desertification. Also, the index of irrigation method classified in very high class of desertification was the most effective factor on land degradation among studied indices in during 2002-2011. Studying the average weight of numerical value, it is distinguished that the intensity of desertification for the total area were 1.93 and 2.10 in 2002 and 2011 respectively.

Keywords: criteria, desertification, Garmsar Plain, IMDPA Model, monitoring.

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Assessments of risk-based of crops water requirement under climate change using AOGCMs

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ABSTRACT

Food security in the world that water shortages are faced is very important, especially in arid regions. Effects of climate change on agricultural water requirement have doubled this importance. In this study, the risk of water demand has been assessed for a wide range of products under climate change. AOGCM models have been used to simulate climate variables. The climate change scenarios of climatic variables were weighted by mean observed temperatures and precipitation method and their probability distribution functions were produced. Using the Monte Carlo method, 200 samples (discrete values) of the probability distribution function of the monthly climatic variables downscaled for each month were extracted by SIMLAB and finally time series of climatic variables has been produced in future. Potential evapotranspiration in the future through the relationship of temperature and potential evapotranspiration in the base period was calculated. With introducing about 200-monthly time series of climatic variables in future period to model, water requirement and changes in crops water demand volume were investigated. Investigations indicate water demand volume for crops based on current area under cultivation will increase between 0.05 and 0.96 (10^6 m^3/yr) for risk of 25%, between 0.04 and 6.87 (10^6 m^3/yr) for risk of 50%, and between 1.16 to 12.68 (10^6 m^3/yr) for risk of 75%. Therefore, the results indicate that risk of water requirements will increase. The volume of water demand will be about 2.5, 16 and 31 (10^6 m^3/yr) with risk of 25, 50 and 75 percent, respectively.

Keywords: AOGCM, climate change, Monte Carlo, risk, uncertainty.

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Evaluation criteria influence soil and land management in the wilderness creation Jazinak Sistan Region

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ABSTRACT

In this research using GIS effect of land management and soil criteria with eight indicators to study the sensitivity to the desert lands of the region of Sistan Jazinak creation is evaluated. Vote based on the model parameters wilderness - the latest creation ESAs evaluation method wilderness creation and in most European countries and the Middle East is used, took place. Using the above method each of the indicators studied work unit was evaluated for each index layer was prepared by the information obtained data compiled GIS environment and desired criteria for each layer made of information was. Ultimately determine the geometric mean combining and intelligence layer criteria examined in the study area based on the model (ESAs), the intensity map obtained desert region creation. Based on the results obtained from the map 8.15 percent low fragile Brigade were part of the 20.08 percent Brigade fragile among moderate, 26.80 percent high-intensity part of the fragile type and 39.45 percent of the area Critical moderate intensity is too much Measure of the numerical value of the soil with 1.22 and the least impact with the numerical value of land management measures 1.72 greatest impact in the desert region has creation. Among the indicators two indicators, respectively, slope and soil texture with a numerical value, and 1.03 and the two lowest impact indicator pebbles and operations management, respectively, with the numerical value of 1.91 and 1.84 Desert greatest impacts on morbidity region are considered.

Keywords: desertification, Jazinak region of sistan, land use, soil.

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Comparison of soil seed bank characteristics between forest and grassland habitats

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ABSTRACT

This study aimed to investigate the effect of habitat kind on soil seed bank characteristics viz. density diversity, richness and similarity between seed bank and above ground vegetation. Two different habitats (grassland and forest) were selected in Vaz, Mazandaran province. The grassland habitat located in the upper end of the forest habitat, adjacent to each other. Then in each habitat, 7 transect perpendicular to slope gradient with 25 meter distance between transect were established; 10 1*1 m plots were selected along each transect. In each plot, 10 soil subsamples were collected and divided into two depths: 0-5 and 5-10 cm. soil sampling was done in winter, 2010. Soil samples were then transferred to and spread in the greenhouse. Germinated plant species were identified, counted and then removed. On the other hand, the above-ground cover of plant species in each plot was recorded in the next growing season. Finally, the number of seeds germinated in the greenhouse was recalculated per meter square and then the similarity between seed bank and aboveground vegetation was calculated in each plot using Sorenson similarity index. Non-paired and paired t-test was applied to compare soil seed bank characteristics between the two habitats and between the two depths, respectively. The results showed that all seed characteristics (with the exception of similarity between aboveground vegetation and soil seed bank in depth 5-10 cm) were significantly higher in grassland than forest. The lower seed characteristics in forest habitat could be related to lower seed input to soil, higher litter percentage and moisture in the above ground of forest habitat. These factors particularly soil moisture and litter could encourage the decomposition of seeds before penetrating soil. In total, the seed of only two shrublands species were germinated in the greenhouse.

Keywords: *Fagus orientalis, Festuca ovina,* forest, Grassland, soil seed bank, Vaz watershed.

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Calibration and validation SWMM model in order to simulate urban runoff (Case study: Imam Ali Town in Mashhad)

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ABSTRACT

Large impervious surfaces and man-made waterways are the characteristic of urban area. Increasing urbanization and rapid growth of cities in recent decades towards the upstream watershed, has been severely affected on rainfall-runoff processes in urban area. Therefore, to computer models in order to illustrate these processes the proper design or assessment of urban drainage systems has special attention. The purpose of this study is simulation and validation the volume of runoff and calibrated SWMM model in small urban area. Required parameters of the model using land use maps, DEM of study area, and field inspection were calculated. For calibration and validation process model, corresponding to three event rainfall runoff measured at the output of the basin and was compared with runoff simulated by the model. The results showed there is good agreement between simulated and observed runoff discharge and depth. There is a little difference between simulated and observed for runoff rate but this difference is more than acceptable value (NS>0.5). NS value for the first, second and third event is the, 0.69, 0.85 and 0.52 respectively. This performance represents that the SWMM model is effective in the study area and this model can be used for in appropriate designs, and evaluate network systems in urban drainage.

Keywords: calibration, SWMM model, urban drainage system, urban runoff, validation.

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Effects of grazing and phenology on water-soluble carbohydrates and nitrogen reserves of three key range species (*Bromus tomentellus*, *Cephalaria kotschyi* and *Ferula haussknekhtii*) in Saral rangelands of Kurdistan Province, Iran

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ABSTRACT

This study conducted to investigate the effects of grazing in a short-term stocking system on the water-soluble carbohydrates (WSC) and nitrogen (N) reserves of permanent parts of *Bromus tomentellus*, *Cephalaria kotschyi* and *Ferula haussknekhtii* in Saral rangelands. A key area was selected with a permanent exclosure area and two temporary exclosure areas. Root excavation was conducted at six to nine phenological stages. Five samples of typical plants were randomly selected for each species at each stage at each of these two sites for studying. Before excavation of the plants, their heights, canopy cover and basal area were measured. WSC and N concentrations were determined as a percentage of sample dry matter with phenol-sulphuric acid and Kjeldahl methods, respectively. The WSC concentration of *B. tomentellus* was not affected neither by studied grazing conditions nor by differences of weather conditions of the studied years. This species had lower carbohydrate concentrations than the forbs. In *C. kotschyi* WSC level was not affected by grazing or the weather condition each year. The low point of WSC reserves in *F. haussknekhtii* occurred during the rapid spring growth, and the highest levels were attained at the end of its growing seasons. Grazing increased the WSC concentrations in the storage organs of the plants of *F. haussknekhtii* and N concentrations of all the studied species. This study suggested that the plant response to grazing increased the resource allocation to storage organs to compensate the deprived reserves in the studied grazing system, so that the rest period works well to improve the plants' vigor. It seems that livestock grazing in this grazing system does not significantly harm two of the three studied species in their sizes.

Keywords: *Bromus tomentellus*, *Cephalaria kotschyi*, exclosure, *Ferula haussknekhtii,* grazing, growth stages.

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An investigation on the effect of fire in short time on growth form and palatability classes in Zagheh rangelands

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ABSTRACT

Fire consider as a factor and basic management in rangeland in order to reform of composition and biological diversity that use in rangeland ecosystems. This project was established to deal with the effect of fire in the research center for rangeland. Zagheh locale where is in 35 km of north eastern of Khoramabad with 1960 meters above sea level. The average comparison and analysis show that herbal forbs which use for grazing form density and average o canopy cover have significant difference at the level of %1 between fire and control area. (P< %1). This study shows that in short time, it is possible to replace perennial. The Prevailing type of grass such as *Agropyron trichophorum- Bromus tomentellus* and *festuca ovina* with *annual grass* like *Bromus tectorum– Heteranthelium piliferum- Taeniatherum crinitum*. These changes indicate perennial grasses and increased annual grasses in short time.

Keywords: burning, grassland, growth form, palatability, perennial grass.

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Comparison of optimization and uncertainty analysis methods in hydrological modeling

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ABSTRACT

Rainfall-runoff modeling is most important component in the water resource management of river basins. The successful application of a conceptual rainfall-runoff model depends on how well it is calibrated. The degree of difficulty in solving the global optimization method is generally dependent on the dimensionality of the model and certain of the characteristics of object function. The purpose of optimization is to finalize the best set of parameters associated with a given calibration data set that optimize the evaluation criteria. In the present study an uncertainty analysis of conceptual rainfall-runoff model (Hymod) were evaluated and compared using the four different evolutionary optimization methods for a Leaf River representative watershed in US. Results appealed that particle swarm optimization (PSO) and shuffled complex evolution (SCE) algorithms had better performances compared to Hybrid Genetic Algorithm & PSO (Hybrid-GA&PSO) and Shuffled Frog Leaping Algorithm (SFLA).

Keywords: evolutionary optimization, Leaf River representative watershed, rainfall-runoff modeling, uncertainty.

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Prediction of precipitation applying Wavelet and ANN Model

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ABSTRACT

Prediction of Precipitation is very important. Regarding to the non- linear relationships and uncertainty of models, there is no superior and persuasive model among various proposed models to simulate precise precipitation and its amount. Wavelet is one of the novel and very effective methods in time series and signals analyzing, that has been considered in the field of hydrology in recent years. In this research, precipitation signal has been decomposed via selected mother wavelet, and then the resulted data are used by fitting direct equations and nero-wavelet hybrid in order to anticipate the precipitation. The mentioned method was applied in Zarringol station (Iran) to predict monthly precipitation since 1975-76 until 2007-2008 for the period of 33 years. The results showed that, by decomposing signal via wavelet, the correlation among observed and calculated data were significantly increased, and the precision of prediction was improved. So that in direct method the value of R^2 is equal to 0.74 and in nero-wavelet hybrid in the best case and for 4 level decompositions, the value is equal to 0.95. This shows the capability of wavelet in simplifying of signal and intensification of accuracy random data in prediction of precipitation. Moreover, the meaningless F test, verifies the mentioned object.

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Comparison of suspended load in two sub-catchments grazed and ungrazed in the Kakhk area of Gonabad

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ABSTRACT

The management of sedimentation problems in rivers and reservoirs depend greatly on the sediment yield from the catchment land surface. In this research the effects of biological measures and ranges enclose on suspended load in two sub-catchments of Kakhk experimental Watershed in Gonabad has been studied. This catchment contains both control and experimental sub-catchments. These sub-catchments are similar in all aspects and differ only based on watershed management operations. Experimental sub-catchment has been under rangeland enclosures and operation of biological, biomechanical and mechanical measurements since 1998 whereas control sub-catchment is under normal operation. To determine the biological impact of management and biological measurements on sediment production, the yield suspended load on hillslopes in 18 experimental erosion plots during 4 rainfall events occurred in 2011-2012 has been analyzed in both control and experimental sub-catchments. Analysis was performed in SPSS software using independent-sample T test and ANOVA with repeated measure test. Based on these comparisons, difference between amounts of suspended load in two sub-catchments was significant at 1 percent level, while runoff depth was significant at 5 percent level. Also results showed that correlation between the runoff depth and suspended load has been 94 percent in Control sub-catchment and 62 percent in Sample sub-catchment. Slope of the line changes between the runoff depth and suspended load in Control sub-catchment has been 5.3 times of the Sample sub-catchment. The research clearly showed the effect of the biological measures and ranges enclose on reduction of suspended load and runoff depth in experimental sub-catchment.

Keywords: biological measures, experimental erosion plot, Kakhk experimental watershed, rangeland enclosures, suspended load.

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Assessment of soil loss estimation method by field indicators (Case study: Shahrak Watershed, Taleghan Basin)

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ABSTRACT

Estimation of the amount of soil loss measurement of field indicators is a low-cost method, is easy to learn and can be simply applied. In order to measure and make assessment of soil loss amount by field indicators method in Shahrak Watershed, first map of the work units was prepared and then, measurements of the relevant field indicators were carried out within these units. Then, EPM model was calibrated and verified. Then the measured data for the amount of the soil loss obtained by using field indicators were analyzed and assessed using EPM experimental model. Mean of relative error and correlation coefficient between values from filed indicators method and EPM model were around 7.6 and 0.9, respectively which these results verify field indicators method for estimation of soil loss intensity. Estimation of the average of soil loss amounts relevant to each of the field indicators shows the following soil losses: Rock exposure indicator: 47.61 (ton/ha), Pedestal indicator: 22.61 (ton/ha), Rill indicator: 5.67 (ton/ha), Sediment in drains indicator: 2.21 (ton/ha), Gully indicator: 2.17 (ton/ha) and Build up against barriers indicator: 34.78 (ton/ha).

Keywords: EPM experimental model, field indicators, Shahrak watershed, soil loss.

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Evaluation of watershed plan on the rate of erosion and sediment in Kan basin

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ABSTRACT

In Iran due to the lack of long experience in the implementation of Soil Conservation and Watershed Management Plans, these measures have not been evaluated quantitatively and specific methods for this purpose have not been provided. In this research effort is to investigate the effect of watershed management operations performed in Can Basin in 1379, on the amount of erosion and sedimentation and rate of project success or failure and its causes. So after providing the required information and statistics and being sure about the authenticity and accuracy of statistics and statistical reconstruction of defects with conventional methods, to investigate the effect of implemented projects on erosion and sedimentation rates, average of suspended sediments in the period before project implementation (1986-2000) and in the period after project implementation (2001-2008) was calculated using sediment rating curves through intermediate technique class, and using daily water discharge, watershed erosion and deposition were also calculated using MPSIAC model. Specific erosion and deposition map was provided in the period after project implementation using Arc GIS software and finally the amount of efficiency and effect of this operation on the amount of erosion and deposition rates was judged. The results of studies showed that due to operating this plan, the average amount of suspended sediment has changed from 47892 tons per year during the statistical period before the plan to 22365 tons per year during the eight-year statistical period after it. The amount of erosion and sedimentation has shifted from 66758 tons to 50549 tons, which shows the positive effect of plan on reducing the amount of suspended sediment and the lack of effective role in reducing the rate of erosion. The main reasons for the low efficiency of Watershed Management Plan implemented in relation to decreasing the amount of erosion are: lack of suitable biological operations in the basin (less than 25 percent of the volume of the proposed action), focusing on mechanical operations, weaknesses in project monitoring and evaluation During all stages of its implementation, failure to observe the standards and technical points such as non-conforming structures built between locations and proposed locations, lack of standards in building the necessary structures and inappropriate dimensions of structures, destruction of floor section in mortar stone structures and etc.

Keywords: erosion and deposition, GIS, suspended sediment, watershed management plans.

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Analysis and assessment of social capital in toward increasing of local communities resilience and sustainable landscape management (Case study: Zangooi village, South Khorasan province, International RFLDL project)

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ABSTRACT

Social capital is one of the most important criteria related to social network resilience. In trust networks as the most important factor of social capital in adaptive governance, sensitivity to disorders and irregularities is considerable and resiliency improvement and compatibility capacity depends on trust level in network. This research is applied in *Zangooi* village, South Khorasan province where international project ROLL is operated. In this research social capital in local beneficiaries is studied to enhance resilience in pilot village. Trust and cooperation ties are studied based on survey method and network analysis questionnaires and direct interviews with actors (members of rural development small groups). Results show that trust, cooperation, cohesion and social capital is at average level before RFLDL project and after operating this project these indices increase and reach optimum level. The speed of trust and cooperation exchange through people increases after operating the project and this develops unification and alliance between members. At last it can be concluded that conveying this project increases trust and cooperation and social capital, so resilient social systems have undoubtedly much more trust level.

Keywords: local communities resilience, RFLDL project, Sarayan, social capital, trust network.

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Evaluation of time-area accuracy in developing IUH

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ABSTRACT

The hydrograph at watershed outlet can be expressed as hydrological response of watershed to geomorphological behavior. In present study with the aid of the GIS and the concept of instantaneous unit hydrograph, the watershed response was simulated. In present physical method, the IUH is derived from three parameters of time of concentration, storage coefficient and time-area curve of the basin. In the present study, the accuracy of various methods of determining time-area curve in providing Clark instantaneous unit hydrograph viz. channel profile, average velocity and Laurenson methods were therefore evaluated. The comparison of estimated and observed hydrographs by using qualitative and quantitative criteria showed that the average velocity method has had the highest accuracy in estimation of time-area method. The results of the quantitative statistics of root mean square of error, bias in peak discharge, coefficient of efficiency, and relative errors in peak discharge, time to peak and base time were respectively found to be 1.39, 0.93, 0.83, and 7.13, 33.33 and 15.38%. The results of this research also showed that the Clark model had a good efficiency in simulation of unit hydrograph in Kasilian watershed, Mazandaran Province, Iran.

Keywords: Clark method, instantaneous unit hydrograph, Kasilian watershed, time-area curve.

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Trend analysis of streamflow in Karkheh Rivers upstream: An evidence for climate change impacts on water resources systems

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ABSTRACT

Within the climate change debate and its probable impacts on water resources systems, design and operation of management plans based on the assumption of stationary hydrology may cause serious challenge to accurately predict future supplies. Therefore this case study is trying to assess trend in hydroclimatic variables of Karkheh Rivers upstream by applying modified Mann-Kendall trend test on long term daily time series of temperature, precipitation and discharge. Temperature variables are mostly showing meaningful increasing trends but observed changes in assessed stations were not spatially uniform for precipitation. Streamflow variables depict a decreasing trend, though more noticeable in base flows. Decreasing trend is meaningful for annual discharge median in Holailan at 90% confidence level. Total yearly precipitation, number of precipitation days and number of days with precipitation equal to, or greater than, 10 mm/d show the most correlation with stream flow variables. Comparing monthly discharge with temperature and precipitation variables in the studied gages indicates a time-delay in system response to inputs. This may related to snowmelt contributions or contributions of water into streams after passing through different hydrological pathways such as groundwater. Some parts of streamflow changes, especially about base flows, is not completely verified by precipitation changes and can be attributed to changes in temperature or another factors such as groundwater overexploitation.

Keywords: autocorrelation, climate change, Karkheh, modified Mann- Kendall, time series.

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