## Drought identification and prediction methodologies in the Guacerique Watershed, Honduras

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Indexes of watershed exposure to drought and aridity were calculated using the Standardized Precipitation Index (SPI) with the formula provided by Cancelliere 2007 and Reconaissance Index (RS) .These indexes simplify complex interrelationships and allow us to evaluate quantitatively climactic anomalies, facilitating the analysis of historical droughts and return periods. The SPI involves the the adjustment of historical monthly precipitation (pp) data to a Gamma distribution probabilistic function, this index allows the analysis of drought in diferent temporal scales and the identification of agricultural and hidrological droughts. The RS has significant advantages above other indexes since it includes besides pp, potential evapotranspiration (PET), this index responds in a similar way to the SPI, however it¥s more sensitive and apropriate for those watersheds with a varing environment. The data used for the calculation of the indexes was obtained from the National Meteorological Service of Honduras, with historical records form 4 to 30 years. Due to to the presence of few meteorological stations the information found in LOC CLIM was used. Additionally there is a lack of PET values for most of the stations or temperature data therefore a linear regresion with the variables of elevation and and temperature allowed for the calculation of PET per pixel in the watershed. For the stations were temperature data was found PET was calculated using the Thornthwaite method. Results show that despite reports of drought in the watershed and the lack of water for agricultural purposes, the watershed is not and has not been subject to meteorological or agricultural drought. A dispersion diagram shows that most of the calculated values for SPI were found in the normal range (-0.99 - 0.99) with very few extreme values for drought or humidity. The years in which the SPI values fell in the humid level or drought level correspond either with the El Niño or la Niña phenomenon. This implies that the so called drought in the area of study is apparently the agravation of water shortage in the watershed due to a global phenomenon. For prediction purposes since no clear tendencies were found to demonstrate a ciclic pattern of the SPI due to time for the average of all the information of the stations obtained by adjustment with a non centered moving average with a lag of 5 where the 5 is the interval of time which was chosen taking into account the separation of time or occurence of the El Niño and Niña phenomenoms. A run test for each station and period was applied to try and determine if there was a pattern in the distribution of the SPI due to time, test shows that values are aleatory except in 1 station where 30 years of records exist which means that with less than 30 years of data no patterns can be identified that don¥t correspond to fluctuations influenced by the the El Niño and Niña phenomenoms since said cycles could be of lags longer than the current 5 years. Since no drought was found , a yearly water balance was calculated. This balance showed a major water deficit than can be attibuted to irrational water use and not to drought. Additionally critical areas to drought were identified. The identification of areas vulnerable to drought was done using GIS, taking into account parameters such as coverage, water catchment areas, erosion potential using RUSLE, precipitation, population density and assigning weighs of importance that were taken into account for the analysis. Furthermore the threat of drought to the watershed was spatialized allowing the calculation of the critical areas to drought and categorized according to levels provided by the National Drought Mitigation Center in the United States.