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Climate Changes Impact on Artificial Wetlands

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Abstract : Artificial wetlands play an important role at Guasca Municipality in Colombia, not only because they are used for the agroindustry, but also because more than 45 species were found, some of which are endemic and migratory birds. Remote sensing was used to determine the changes in the area occupied by water of artificial wetlands by means of Aster and Modis images for different time periods. Evapotranspiration was also determined by three methods: Surface Energy Balance System-Su (SEBS) algorithm, Surface Energy Balance- Bastiaanssen (SEBAL) algorithm, and Potential Evapotranspiration- FAO. Empirical equations were also developed to determine the relationship between Normalized Difference Vegetation Index (NDVI) versus net radiation, ambient temperature and rain with an obtained R2 of 0.83. Groundwater level fluctuations on a daily basis were studied as well. Data from a piezometer placed next to the wetland were fitted with rain changes (with two weather stations located at the proximities of the wetlands) by means of multiple regression and time series analysis, the R2 from the calculated and measured values resulted was higher than 0.98. Information from nearby weather stations provided information for ordinary kriging as well as the results for the Digital Elevation Model (DEM) developed by using PCI software. Standard models (exponential, spherical, circular, gaussian, linear) to describe spatial variation were tested. Ordinary Cokriging between height and rain variables were also tested, to determine if the accuracy of the interpolation would increase. The results showed no significant differences giving the fact that the mean result of the spherical function for the rain samples after ordinary kriging was 58.06 and a standard deviation of 18.06. The cokriging using for the variable rain, a spherical function; for height variable, the power function and for the cross variable (rain and height), the spherical function had a mean of 57.58 and a standard deviation of 18.36. Threatens of eutrophication were also studied, given the unconsciousness of neighbours and government deficiency. Water quality was determined over the years; different parameters were studied to determine the chemical characteristics of water. In addition, 600 pesticides were studied by gas and liquid chromatography. Results showed that coliforms, nitrogen, phosphorous and prochloraz were the most significant contaminants.

Keywords : DEM, evapotranspiration, geostatistics, NDVI
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