PREDICTION OF WATER QUALITY OF UPPER GREEN RIVER WATERSHED, KENTUCKY, USA USING CLUSTER-BASED NEURAL NETWORK MODELS

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ABSTRACT

Water bodies are contaminating rather easily due to wastewater discharge from the various point and nonpoint sources (run-off from agricultural land and discharges from industries and municipalities). Upper Green River watershed in Kentucky is one of these watersheds affecting due to such contamination. It is necessary to understand water quality parameters quantitatively to define the water quality status of rivers. Multivariate statistical techniques are routinely used for quantitative description of river water quality parameters but are not considered to be comprehensive, predicting tools. In this paper, an attempt has been made to predict the status of quality of Green River water using cluster analysis and neural networks. A model that combined k-means clustering and neural networks has been developed to predict fecal coliform, Turbidity, pH and Conductivity concentration in Upper Green River watershed. While another approach has been carried out with the Kohonen Neural Network, which is an unsupervised clustering mechanism. The input dataset containing six-months of data has been divided into a number of groups based on the similarities between them. The output data points in these clusters have used in the development of feed-forward neural network models to predict water quality parameters of Green River. Further analysis has been performed to get best output values by using different activation functions viz., hyperbolic tangent and Sigmoidal, and different backpropagation algorithms namely Levenberg-Marquardt and Scaled Conjugate. The paper concludes with an analysis of the results of both K – Means clustering and Kohonen Neural Networks.

Keywords: *Water quality; K – Means clustering; Kohonen Neural Network; Fecal Coliform; Turbidity, pH; Conductivity.*