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UTILIZATION OF TWO ARTIFICIAL NEURAL NETWORK METHODS IN SURFACE WATER QUALITY MODELING

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Abstract

Artificial neural networks (ANNs) are capable of learning the relationships between the dependent and predictor surface water quality variables and have a high ability to predict from the new data set. In this study, two different ANN methods, the feedforward network (FFN) and the cascadeforward network (CFN) were applied to predict two surface water quality variables such as chlorophyll-a (Chl-a) and fecal coliform (FC) using twelve other variables as an input to the models. Both methods, for developing and training the ANN, are multilayer, leading to the same architecture of the feedforward neural network trained by back-propagation learning algorithm. The networks were supplied with two subsets of water quality data, with two-thirds being used for training and one-third for testing the performance of the networks, after pre-processing of the data set (110 samples) by normalization and moving average techniques. The performances of both ANN methods were evaluated visually by plotting and quantitatively by using five statistical parameters. The training procedures of both ANN methods for Chl-a and FC were very successful and a perfect match was obtained between the measured and predicted values with the correlation coefficient (R) of 1.00. The testing or prediction results also produced good agreements with the measured data of Chl-a and FC in terms of R values of 0.83, 0.93 (for FFN), and 0.89, 0.91 (for CFN), respectively. Results of this study show that ANN methods are able to predict Chl-a and FC with reasonable accuracy, suggesting that ANN is a valuable and powerful tool for surface water quality modeling and management.

Key words: Cascadeforward network, feedforward network, surface water, water quality modeling.

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