

P303

Ecological Informatics and Quantitative Evaluation of Aquatic Ecosystems

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Due to the "double-edged" problem of water resources on the global basis, shortage and contamination, sustainable management of aquatic ecosystems is not only a regional or within-nation problem, but is one of the key environmental issues problematic to the world. In order to properly deal with the problems of aquatic ecosystems, it is a pre-requisite to "objectively" evaluate the impact of anthropogenic stresses on disturbed water resources, regarding patterning and prediction of ecosystem changes and assessment of economic values charged to recovering damaged ecosystems. Due to complexity resided in ecological data, however, it is difficult to develop reliable evaluation methods. Recently computational methods based on adaptive and parallel-distributed information theories have incorporated technical development of quantifying ecosystem quality. Numerous models in machine learning, especially in the field of artificial neural networks, have been rapidly developed in the aspects of forecasting community dynamics, data classification, ecosystem analysis and water quality evaluation. Frequently used methods in ecological informatics are introduced in the presentation. Multilayer perceptron was utilized to pattern community-environment relationships and to predict community abundance and habitat suitability. The methods for unsupervised learning, such as the Kohonen network and the Adaptive Resonance Theory, were used to classify and ordinate ecosystem data through self-organization. Temporal models including recurrent neural networks were implemented to forecast time series data. Other relevant methods used in ecosystem quantification and organization were introduced and the perspectives of ecological informatics in the future of aquatic ecosystem management were discussed.