**TITLE:** WATERSHED CLASSIFICATION BY DISCRIMINANT ANALYSES OF LAKEWATER-CHEMISTRY AND TERRESTRIAL CHARACTERISTICS

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**Abstract:** We used canonical discriminant analyses to improve an existing classification scheme by identifying those lakewater-chemistry and terrestrial variables that can jointly differentiate among a set of lakes in the Adirondack region of the northeastern USA. We then used predictive discriminant analysis to examine the ability of the models constructed in predicting class membership for lakes with unknown hydrogeological settings into known classes. We used two sets of data collected during summers of 1984–1987 and 1994. For both periods, two main underlying dimensions were identified reflecting watershed hydrogeology and lake dissolved organic carbon. The hydrogeological construct was defined by lakewater concentrations of Ca, Mg, Na, and Si. This construct provides a continuous index from several previously assigned class variables and can help in data reduction and elimination of multicolinearity in further multivariate studies of ecosystem processes in the study lakes. The importance of Ca in defining the hydrogeological construct decreased from 1984–1987 to 1994, due to differential decrease in Ca concentration in the lake classes. The periodic decrease in Ca concentration of many drainage lakes suggests that they continue to lose buffering capacity to acidic deposition and that the current decreased emission and deposition of acidic S compounds may not be sufficient for chemical recovery of these lakes. The construct reflecting lakewater concentration of dissolved organic carbon was defined by lakewater Fe concentration and the lake-volume-weighted watershed areas covered by wetlands and forest. Our methodology and results should provide useful information for studies conducted in the Adirondack watersheds and may be applicable to other regions with properties and environmental issues comparable to those in the Adirondack region.

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