



## MACROPHYTES IN BOREAL STREAMS: CHARACTERIZING AND PREDICTING OCCURRENCE AND ABUNDANCE TO ASSESS HUMAN IMPACT

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### ABSTRACT

Macrophytes constitute a structurally and functionally essential element of stream ecosystems and therefore should be an indispensable element in assessment and protection of stream ecosystems. Modeling, based on continuous environmental gradients offers a realistic approach to predict natural communities and detect anthropogenic community change. Using data from minimally disturbed streams, we described natural stream macrophyte assemblage clusters and then explored the variation in them attributable to large scale environmental factors. We then developed and evaluated RIVPACS-type models to predict the presence and abundance of macrophyte taxa at stream sites in the absence of human influence. We compared the responses of a range of biotic indices, based on predicted and observed values, to human stress. The size of the catchment area, altitude, latitude and percentage cover of lakes in catchment area were the large scale environmental variables that best discriminated among the assemblage clusters of riffle and pool habitats separately and in combination. Including both riffle and pool data as well as abundances (rather than mere presence/absence) of macrophytes in the index-calculations improved the accuracy, precision and sensitivity of the assessment. The precision and accuracy of the model was of the same level as in previous studies for macrophytes and other biotic groups. Our results show that macrophyte communities respond to deterioration of water quality and changes in the proportion of natural land use in the catchment and in the adjacent riparian area supporting the use of multivariate modeling techniques in the assessment of macrophytes in boreal streams.