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## Indicators of nitrate in wetland surface and soil-waters: interactions of vegetation and environmental factors

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**Abstract.** This paper describes a new bio-indicator method for assessing wetland ecosystem health; as such, the study is particularly relevant to current legislation such as the EU Water Framework Directive, which provides a baseline of the current status of surface waters. Seven wetland sites were monitored across northern Britain, with model construction data for predicting eco-hydrological relationships collected from five sites during 1999. Two new sites and one repeat site were monitored during 2000 to provide model test data. The main growing season for the vegetation, and hence the sampling period, was May–August during both years. Seasonal mean concentrations of nitrate ( $\text{NO}_3^-$ ) in surface and soil water samples during 1999 ranged from 0.01 to 14.07 mg N l<sup>-1</sup>, with a mean value of 1.01 mg N l<sup>-1</sup>. During 2000, concentrations ranged from trace level (<0.01 mg N l<sup>-1</sup>) to 9.43 mg N l<sup>-1</sup>, with a mean of 2.73 mg N l<sup>-1</sup>. Surface and soil-water nitrate concentrations did not influence plant species composition significantly across representative tall herb fen and mire communities. Predictive relationships were found between nitrate concentrations and structural characteristics of the wetland vegetation, and a model was developed which predicted nitrate concentrations from measures of plant diversity, canopy structure and density of reproductive structures. Two further models, which predicted stem density and density of reproductive structures respectively, utilised nitrate concentration as one of the independent predictor variables. The models were tested where appropriate using data collected during 2000. This approach is complementary to species-based monitoring, representing a useful and simple tool to assess ecological status in target wetland systems and has potential for bio-indication purposes.

**Keywords:** bio-indicators, surface water, water quality, wetland vegetation

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