

## Composition and spatial heterogeneity of submersed vegetation in a softwater lake in Wisconsin\*

Stephen R. Carpenter<sup>1</sup> & John E. Titus<sup>2\*\*</sup>, \*\*\*

<sup>1</sup>*Department of Biology, University of Notre Dame, Notre Dame, IN 46556, U.S.A.*; <sup>2</sup>*Department of Biological Sciences, State University of New York, Binghamton, NY 13901, U.S.A.*

Keywords: Aquatic macrophyte, Compositional change, Co-occurrence group, Heterogeneity, Pattern analysis, Polar ordination, Segregation, Wisconsin, Zonation

### Abstract

Big Muskellunge Lake, a softwater lake (pH 7.5–8.0, alkalinity 0.36 meq/L) in northern Wisconsin, harbors a diverse (25 species) submersed macrophyte vegetation. The present submersed flora combines species generally thought distinct in their ecological affinities, and is very similar to that reported in 1935. The only differences are the apparent loss of three previously infrequent *Potamogeton* species, and the addition to the flora of two infrequent *Potamogeton* species and the now abundant *Eloдея canadensis*. Dramatic differences in composition and pattern of the vegetation occurred between sites of contrasting exposure and sediment type. Substantial compositional variation, at scales ranging from tens of centimeters to tens of meters, occurred along transects of contiguous quadrats at uniform depth and exposure. Analyses of species sequences along line transects detected significant segregation of species that is most plausibly explained by biotic factors such as colonization, clonal growth, and competition. Heterogeneity at small scales of a few meters or less is common in Big Muskellunge Lake. Such pattern has been neglected in macrophyte ecology, in spite of its significance for neighbor relationships which may critically influence growth and reproduction of aquatic plants.