



## The role of submerged macrophyte beds in phosphorus and sediment accumulation in Lake Memphremagog, Quebec, Canada

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**ABSTRACT:** The relationships between long-term (~115-year) phosphorus and sediment accumulation and submerged macrophyte biomass were determined both within a submerged macrophyte bed and among beds in Lake Memphremagog, Quebec, Canada. Strong relationships between present submerged macrophyte biomass and littoral-zone sediment and phosphorus accumulation rates both within and among macrophyte beds yielded simple models for estimating long-term littoral-zone accumulation rates. Mean sediment particle size at the depth of maximum submerged macrophyte biomass, estimated from water content, was comparable with the mean particle size in profundal zone of Lake Memphremagog, suggesting that energy environments differ little between vegetated littoral zones and profundal zones. The mean total sediment-accumulation rate of 1.2 mm yr<sup>-1</sup> in the macrophyte beds was indistinguishable from average profundal rates of sediment accumulation in North American lakes. Although dense beds accumulated twice as much bulk sediment per unit area (g m<sup>-2</sup> yr<sup>-1</sup>) compared with their profundal counterparts, phosphorus accumulation per unit bulk sediment in macrophyte beds with a biomass of 1,000 g m<sup>-2</sup> (wet weight) was one sixth that measured in profundal sediments, pointing to large postdepositional losses of sedimented phosphorus (>70%) from macrophyte beds. Finally, extrapolation of the present results to five nearby lakes suggests, based on still-limited data, that, in lakes in which half of the sediment surface is colonized by submerged macrophytes, the littoral zone accounts for roughly one third of whole-lake phosphorus and two thirds of whole-lake bulk sediment accumulated annually.

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