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Phosphorus retention and movement across an ombrotrophic-minerotrophic peatland gradient

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Abstract. An understanding of the mechanisms controlling nutrient availability and retention in and across ecosystems allows for a greater understanding of the role of nutrients in maintaining ecosystem structure and function. To examine the underlying mechanisms of phosphorus (P) cycling in northern peatlands, we compared the retention and movement of P across a natural hydrologic/pH gradient in nine peatlands by applying as a light rain an *in situ* tracer amount of $^{32}PO_4^{-3}$ to track changes in P pools (vegetation, soil, microbial) over 30 days. The ^{31}P concentrations of available P, microbial P, and the root P at 10–20 cm did not differ across the gradient, although total soil P and aboveground vegetation P content ($\mu g\ m^{-2}$) increased from bog to rich fen. Total retention of ^{32}P in the first 24 hours of application was greatest in the bogs and intermediate fens (90–100%) and was very low (20–50%) in the rich fens. Retention of P in the different pools was dependent on the type of peatland and changed with time. In the first 24 hours in the bogs and intermediate fens, the microbial pool contained the largest amount of ^{32}P, but by the seventh day, the aboveground vegetation contained the largest amount. In the rich fen, the recovered ^{32}P was almost equally divided between the aboveground vegetation and the litter layer with very little in other pools. Therefore, although bogs and intermediate fens have a small total P pool, they have similar P availability to rich fens because of rapid cycling and efficient retention of P.