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Nitrogen and 15N in the Mer Bleue peatland

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Although much of our attention in peatlands has focussed on carbon, as CO_2, CH4 and DOC processing and fluxes, N plays an important role in the functioning of these ecosystems. Here, I present information on the distribution of N and 15N in plant and peat tissues and relate them to the cycling of N.

N concentration in foliar tissues, ranged from 0.67 to 1.3% in evergreen shrubs and trees and mosses with little seasonal variation, and with a strong seasonal variation from 0.5 to 3.5% in the deciduous forbs, shrubs and trees, with a strong overall relationship to [chlorophyll]. Although the proportion of shrubs and mosses varied with microtopography the spatial foliar mass of N varied little with water table position, resulting in minor spatial variations in photosynthetic potential. Decomposition of plant tissues through litter to peat resulted in a decrease in the C:N ratio from about 50:1 to about 30:1 at the base of the profile, representing peat about 8000 yr old. This marginally larger loss of N through decomposition (mainly as TDN, 0.4 g N m-2 yr-1) compared to C produced a long-term N accumulation rate of 0.9 g N m-2 yr-1, being smaller in the bog phase, 0.6 N m-2 yr-1, and over past 150 yr, 0.8 g N m-2 yr-1. Although N is 'hard won' through N2 fixation, northern peatlands are significant global sinks of N and have limited N availability.

del15N in foliar tissues ranged from -4 to -9 ‰ in evergreen and deciduous shrubs and trees, from -4 to -5 ‰ in mosses and from -1 to +1 ‰ in sedges and forbs. This appears to be a function of the mycorhizzal infection of the shrubs and trees, compared to sedges and forbs and the values for mosses may partially reflect the signature of atmospheric N deposition. There was no strong correlation between foliar [N] and del15N.

In peat profiles from bog and fen sections of Mer Bleue, del15N values in peat fell from -5 to -2 ‰ in the top 10 cm to values of -1 to +1 ‰ at a depth of 40 cm and remained close to 0 ‰ below this. In 30-cm thick beaver pond sediments, the del15N values remained between 0 and +2 ‰À number of processes may account for the increase in the del15N with depth in the peat profile: more rapid decomposition of tissues with larger del15N values than the slowly decomposing mosses; fractionation of N during decomposition, leaving the heavier 15N enriched in the peat; fractionation during denitrification (though denitrification potentials and emissions are small). An intriguing possibility is that methane oxidation at and just above the water table would lead to an increase in del15N, assuming the fixed N2 has a del15N close to 0.