LETTER

Edge effects in temperate forests subjected to high nitrogen deposition

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Reinmann and Hutyra (1) measured an increase in aboveground forest growth and biomass at temperate oak forest edges (0–10 m) compared with the interior (20–30 m). When scaling their results up to the region of southern New England, they obtained an increase in aboveground carbon (C) uptake (13%) and C storage (10%) when forest edges were considered. They stated that current approaches used to quantify regional and global C budgets may underestimate C sequestration in forests.

We applaud the authors for conducting research in forest edges, which are still understudied despite their ample occurrence in present-day fragmented landscapes. However, when the impact of the edge effect on C sequestration is scaled up, results of our studies suggest that belowground C storage at forest edges should also not be neglected. Remy et al. (2) measured an increase in C and nitrogen (N) stocks in both mineral soil (30%) and roots (48%) up to 30 cm deep in temperate broadleaf and coniferous forest edges (0–8 m) in Belgium and Denmark compared with the forest interior (128 m).

Furthermore, Reinmann and Hutyra (1) suggest a potential interaction between land-use change (i.e., forest fragmentation) and climate change through responses on forest growth. We looked into the interaction of land-use change with N deposition, another driver of global change. Remy (3) observed that the edge conditions (increased solar radiation, higher soil temperatures, higher atmospheric deposition, lower forest floor C/N ratios, and higher litter input) increased the abundance of litter- and soil-dwelling detritivorous fauna, which, in turn, stimulated N cycling processes, via increased litter decomposition and mineralization rates. Furthermore, forest edges affected gaseous C and N cycles via an increased uptake of methane and a decreased emission of nitric oxide (4). Consequently, edge-specific conditions not only stimulate forest growth but also increase above- and belowground C and N storage through altered N cycling.

Several other researchers had already highlighted the impact of N deposition on C sequestration. De Vries et al. (5) obtained a soil response of 10–30 kg of C per kg of N under a total N deposition of 10–25 $kg \cdot ha^{-1} \cdot y^{-1}$, and Janssens et al. (6) showed that enhanced N availability indirectly increased soil C storage by reducing organic matter turnover.

In concordance with Reinmann and Hutyra (1), our findings underline the need to include forest edge effects in programs and models monitoring forest C changes, since they may cause substantial additional amounts of C storage, both above- and belowground.

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