

# Response of temperate forest N status to long-term recovery from acidification and decreasing atmospheric N deposition

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Nitrogen (N) depositions in European forests are decreasing, while there were local signs of initial recovery from acidification during the past three decades, but it is unclear how long N-saturated forests will take to recover. We aimed to test the hypothesis that forest N status in northwest Europe has started to improve. We evaluated the evolution of multiple N saturation indicators in five ICP Forests Level II plots in northern Belgium, using long-term soil solution and foliage datasets (1999–2015):

- Throughfall depositions of dissolved inorganic N decreased by 2.4–5.0% per year.
- The ratio of dissolved organic nitrogen (DON) and total dissolved nitrogen (TDN) in soil solution, DON:TDN increased since 2005 in all plots.
- The ratio of dissolved organic carbon (DOC) and nitrate ( $\text{NO}_3^-$ ) in soil solution, DOC: $\text{NO}_3^-$  increased since 2002 in four out of five plots.
- The ratio of N and phosphorus (P) in foliage, N:P remained unchanged.
- The ratio of base cations (Bc = calcium + potassium + magnesium) and N in foliage, Bc:N remained unchanged.

Changes in the soil solution chemical composition confirmed an improvement in forest N status, but biotic recovery appeared pending given the constant foliar N:P ratio and Bc:N ratio. This questions if common critical DOC: $\text{NO}_3^-$  limits are stringent enough for European forest soils. Clearly, insight in forest recovery from N saturation requires a multiple indicator approach, and further monitoring of foliar N:P levels alongside these soil processes is needed to monitor the evolution of forest N status.

*Preferred session:*

- 1) *All Division 7 Meeting—“Forest Health”: Session 191 Nitrogen deposition: spatial-temporal change and ecological impacts*